



## King's Research Portal

DOI:

[10.1086/676124](https://doi.org/10.1086/676124)

*Document Version*

Publisher's PDF, also known as Version of record

[Link to publication record in King's Research Portal](#)

*Citation for published version (APA):*

Caduff, C. (2014). Pandemic Prophecy, or How to Have Faith in Reason. *CURRENT ANTHROPOLOGY*, 55(3), 296-315. <https://doi.org/10.1086/676124>

### **Citing this paper**

Please note that where the full-text provided on King's Research Portal is the Author Accepted Manuscript or Post-Print version this may differ from the final Published version. If citing, it is advised that you check and use the publisher's definitive version for pagination, volume/issue, and date of publication details. And where the final published version is provided on the Research Portal, if citing you are again advised to check the publisher's website for any subsequent corrections.

### **General rights**

Copyright and moral rights for the publications made accessible in the Research Portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognize and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the Research Portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the Research Portal

### **Take down policy**

If you believe that this document breaches copyright please contact [librarypure@kcl.ac.uk](mailto:librarypure@kcl.ac.uk) providing details, and we will remove access to the work immediately and investigate your claim.

# Pandemic Prophecy, or How to Have Faith in Reason

by Carlo Caduff

In scientific discourse, as well as in public debates, scientists are often presented as charismatic prophets with a message for the people. My aim, in this article, is to explore the place of prophecy in today's politics of pandemic preparedness in the United States. How is the category of the unknown invoked in scientifically inspired prophetic proclamations? At stake in such an inquiry are the ways in which a prophetic existence is capacitated or incapacitated at the threshold of the known and the unknown. What does it take for the prophet's voice to be recognized as reasonable and accepted as authoritative? Charismatic personality and discursive authorization play significant roles, to be sure. But the efficacy of pandemic prophecy must also be situated in relation to the temporal sensibilities and anxieties to which they respond. What is the architecture of these sensibilities and anxieties?

*Here the usual question is, "When will this happen?" But the question is completely ill-timed. . . . To all those who make . . . calculations on this subject comes the command, "Relax your fingers, and give them a rest." (Augustine, The City of God [1998])*

Let me introduce to you the two popes of influenza: Dr. Robert Webster and Dr. Peter Palese. Webster currently holds the Rose Marie Thomas Chair in the Department of Infectious Diseases at St. Jude Research Hospital in Memphis, Tennessee. A microbiologist by profession, Webster has spent more than 50 years investigating influenza viruses in the laboratory. Among his most prominent contributions to the advancement of science is his important insight that pandemics occur when avian and human viruses mix their genes and generate new strains, a process that he calls "viral sex." Over the years, Webster and his colleagues at St. Jude's have assembled over 12,000 samples of avian influenza viruses, a unique collection of microorganisms that offers new insights into the natural evolution of influenza viruses. Until very recently, Webster was also Director of the World Health Organization Collaborating Center on the Ecology of Influenza Viruses in Lower Animals and Birds.

The other pope of influenza is Peter Palese, Horace W. Goldsmith Professor and Chair of the Microbiology Department at the Mount Sinai School of Medicine in New York City. Palese secured his position as a leading researcher when

he pioneered the field of reverse genetics for negative-strand RNA viruses, a category of pathogens that also includes the influenza virus. Reverse genetics is a powerful technology that has become an essential tool in experimental research worldwide. It has allowed Palese and his colleagues at Mount Sinai to reconstruct in the laboratory, under controlled conditions and with the necessary precautions, the pandemic virus that killed between 20 and 50 million people in 1918–1919. Palese has published more than 300 research articles in prominent journals, and he is a member of the National Academy of Sciences in the United States. Over the past 4 decades, he has mentored many researchers in his Mount Sinai laboratory, 16 floors above Central Park.

I encountered the two popes of influenza—as the media often refer to them—while I was conducting ethnographic research in the United States over a period of 18 months between 2006 and 2008. During my fieldwork in New York City I worked with Palese on a regular basis and have come to know him fairly well as a scientist and as a person. I encountered Webster only once, by coincidence, at a conference in Hong Kong, where we met informally over lunch to discuss his life and work. Webster and Palese are both eminent scientists and charismatic authorities, but these two white men in their white coats are not only the powerful popes of a scientific community, they are also modern prophets with a message for the people. Webster and Palese have examined the protean virus intensively in the laboratory, focusing on the disease and its multiple forms, which range from a seasonal nuisance to a deadly plague. The two prophets have deciphered the signs of the times carefully, predicted the course of events accordingly, and envisioned futures that are diametrically opposed to one another.

For Webster, pandemic preparedness is a matter of survival. The highly pathogenic H5N1 avian influenza virus that has

**Carlo Caduff** is Lecturer in the Department of Social Science, Health, and Medicine in the School of Social Science and Public Policy of King's College London (King's Building, The Strand, London WC2R 2LS, United Kingdom [carlo.caduff@kcl.ac.uk]). This paper was submitted 22 X 12, accepted 10 II 13, and electronically published 17 IV 14.

been spreading across Asian countries by way of migratory birds and domestic poultry is “the scariest thing” he has ever seen, a “killer strain lurking in the shadows,” as he likes to put it. In his frequent media appearances, Webster has been eager to discuss worst-case scenarios, urging public health professionals to prepare immediately for the impending disaster. He has also supported pharmaceutical companies in the development of effective treatments to protect the health of populations and the wealth of nations. A relentless stream of newspaper articles, television programs, and radio reports featuring Webster and other experts has placed the pandemic at the center of political debates in the United States and elsewhere, inundating the public sphere with drastic renderings of a global catastrophe.

Palese, by contrast, has promoted another perspective. He is less thrilled and much more relaxed when it comes to the pandemic threat, consistently suggesting that the current debate is all hype and no substance. For Palese, the H5N1 avian influenza virus is unlikely to trigger the next pandemic. In his view, the presumable threat is empty hype manufactured by infectious-disease specialists and public health professionals as a way to garner public attention, galvanize social and political action, and create a growing market for therapeutic products. He believes that experts have exaggerated the potential for a catastrophic pandemic primarily for dramatic effect and to fabricate a pervasive climate of anxiety and apprehension. According to Palese, today’s false prophets have contributed to the production of a political culture of fear in the United States, legitimizing a politics of preparedness that expects Americans to have an emergency plan and take responsibility for their survival in the event of a pandemic.

In this article, I take my encounters with Webster and Palese as a starting point for an ethnographic exploration of prophetic claims in the United States. What is it that allows a prophetic message, cast in scientific terms, to gain traction in public discourse? Why are some prophets more successful than others with their scientifically inspired visions of the future? What, in other words, makes one vision more reasonable and authoritative than others? Given today’s obsession with catastrophic forms of disease, what kind of knowledge might anthropologists be able to generate on the basis of encounters with experts? What is at stake for the discipline of anthropology itself as a form of “expertise”?

These questions are very general, to be sure, and they call for a broad range of answers. Clearly, the factors contributing to the prosperity of pandemic prophecy are complex and overdetermined. In the United States, for instance, it would be essential to take into account the long history of apocalyptic thinking in the nineteenth and twentieth centuries. As many scholars have argued, dark visions of impending disaster have been a fixture of American culture for many decades.<sup>1</sup> According to Kathleen Stewart and Susan Harding, the apoc-

alyptic mode of thinking “has come to inhabit and structure modern American life across a wide range of registers” (1999: 286). Stewart and Harding underscore that there has been much traffic between religious and secular apocalypticism as a mode of thinking “transfixed by the possibility of imminent catastrophe” (286). In an astute analysis, Joseph Masco has shown the extent to which the catastrophic threat of a nuclear attack has been a productive ideological source of nation-building in Cold-War and post-Cold-War America (Masco 2008).<sup>2</sup> Many US citizens have grown up in a political culture of fear, and they remember vividly always having to be alert and prepared for a possible attack. As Masco noted, America constructed its national community “via contemplation of specific images of mass death while building a defense complex that demands ever more personal sacrifice in the name of security” (2010:152). Such images of threat and promise organize reality as “fear and thrill” (Aretxaga 2002:140). In addition, today’s imaginations of a catastrophic rupture brought about by a terrible plague must also be read symptomatically in terms of the unspeakable traumas to which these imaginations refer, as James Berger has proposed (1999). And finally, we should take seriously Melinda Cooper’s suggestion that these imaginations must be analyzed in the context of an emerging economy of disaster capitalism (2008), which combines the “prophetic with the profitable” in new ways (Comaroff and Comaroff 1999:281).

My aim here, however, is not to cover the totality of social, cultural, political, and economic conditions that have rendered prophecies plausible in US public culture. The efficacy of pandemic prophecy clearly depends on many conditions of possibility; it can take many forms, accomplish many functions, and serve many actors and institutions, depending on time and place. My aim, rather, is to extend a prominent body of scholarly work in the social studies of science, which has examined the construction and contestation of facts. At issue in this article is a category of claims stretching and perhaps even exceeding the domain of the strictly factual. Focusing on the public profile of science, I explore the place of the unknown in today’s politics of pandemic preparedness. How is the category of the unknown invoked in scientifically inspired prophetic proclamations like those that Webster and Palese make? At stake in this inquiry more generally are the ways in which a prophetic existence is capacitated or incapacitated at the threshold of the known and the unknown. What does it take for the prophet’s voice to be recognized as reasonable and accepted as authoritative? Charismatic personality and discursive authorization play significant roles, to be sure. But the efficacy of pandemic prophecy must also be situated in relation to the temporal sensibilities and anxieties to which they respond. What these have made possible is for the prophet’s voice to be heard.

My argument is situated in recent debates about modernity and temporality. In his *Observations on Modernity*, Niklas

1. See, among others, Boyer (1992); Faubion (2001); Harding (2000); and O’Leary (1994).

2. See as well Masco (2006) and Weldes et al. (1999).

Luhmann wonders about the forms in which the future manifests itself (1998). Luhmann's interest, according to Andrew Lakoff, "is not in a prophetic temporality in which an already determined human fate is prefigured in the present, but rather in a distinctively modern time that calculates a future that 'can always turn out otherwise'—a provisional foresight" (2008:401). At the heart of Luhmann's conception of the modern condition as an "ecology of ignorance," however, is a problematic understanding of temporality. Taking for granted modernity's account of itself as a historical project of advancing rationalization, Luhmann believes that "necessity" is increasingly replaced with "contingency." He thus argues that a "prophetic temporality" is gradually substituted with a "provisional foresight." However, on the basis of such an understanding of modernity, a scientifically inspired prophetic enunciation can only appear as a contradiction in terms. In Luhmann's view, scientists are scientists and not prophets.<sup>3</sup> What scientists embody in their public performances is not a prophetic existence. Modern scientists, according to the sociologist, have rejected the notion of an inevitable if not predetermined course of events. Yet in scientific discourse, as well as in public debates, scientists are perpetually presented as charismatic prophets with a message for the people. They are generally credited with the power to predict. Significantly, these predictions are not necessarily based on scientific evidence in the strict sense of the term, but they are nevertheless pronounced in a scientific manner and thus appear to be scientifically inspired. The tone is both authoritative and imperative. At stake are future events, which are presumed to be "only a question of time." The pandemic is coming. We must prepare. It will happen. It is inevitable. How, then, to account for the scientifically inspired prophetic existence? How to account for the growing circulation of speculative facts and fantastic persuasions? How to make sense of enchantment's endurance in the march of modernity? Has science come under the influence of magical realism? I suggest that we do not presume a general shift from faith to reason, as Luhmann does; rather, we should follow Hirokazu Miyazaki's lead and explore how prophetic pronouncements calibrate the relation between faith and reason (2007:431). Faith, in other words, operates at the heart of reason, not at its limits or margins. Faith is an essential part of reason, and reason continues to rely on it. The challenge is to figure out how.

3. In *The Courage of Truth*, Michel Foucault outlines a typology of the prophet, the parrhesiast, the sage, and the expert. The limitation of this typological approach is that it sets apart the expert's mode of veridiction from the prophet's mode of veridiction. Foucault is well aware of the problem. He underscores that "it will happen very often, even more often than not, that these modes of veridiction are combined with each other, and we find them in forms of discourse, types of institutions, and social characters which mix the modes of veridiction with each other." In his lectures, however, Foucault stops short of providing us with an actual account of how these different modes of veridiction bleed into each other. I use the term "speculative fact" in this article to highlight the mutual absorption of these modes of veridiction (Foucault 2011:26).

In the next section, I will return to the two popes of influenza and explore their opposed prophetic messages in more detail.<sup>4</sup> I will then inquire into the more general conditions that either capacitate or incapacitate a prophetic existence at the threshold of the known and the unknown. My aim is to situate the prophetic rivalry in the context of particular cosmological considerations concerning "mutant strains" and ethical elaborations concerning "harmful consequences." I then highlight a set of anxieties that have erupted as a result of temporal incongruities, which are at the heart of these cosmological considerations and ethical elaborations. I argue that these anxieties partially account for the efficacy of a scientifically inspired pandemic prophecy. Temporal incongruities, as Carol Greenhouse has demonstrated, matter considerably, precisely because questions about temporality are always also questions about agency and its distribution across the social world (1996:4). Let me now turn to the two prophets.

## The Rise of Prophets

"If you're a chicken," said Palese, "the H5N1 virus is a very bad virus." Palese has always insisted to me that he did not believe the highly pathogenic H5N1 avian influenza virus was likely to trigger the next pandemic. "I mean, you can never exclude it," he specified, "but I think this is all hyped-up." According to Palese, the threat of pandemic influenza was not as imminent as his colleagues suggested in their dramatic op-ed articles and television appearances. But the hype had increasingly become a powerful source for the production of knowledge, the affirmation of authority, and the redistribution of resources.<sup>5</sup> Today's frantic debate about the pandemic threat, Palese pointed out to me, was the result of a hysterical climate of fear manufactured by experts. Challenging dominant narratives of pandemic doom, Palese contested Webster's apocalyptic vision, replacing it with his own perspective of the future. Thus he assumed the position of a counter-prophet with a counter-prophecy and was eager to talk to me about it. "I can tell you, I have a virus in my freezer, which is from 1959," he once explained to me. "It has been equally devastating, it has killed hundreds of thousands of birds in Scotland, and it's also an H5N1 virus. It has just not been studied that well. Many colleagues try to suppress that, or don't want to acknowledge that." Palese was upset and annoyed. But his critical remarks about his colleagues did not surprise me. His answers were always straightforward. His talk was always blunt. His message was always clear. The counter-prophet of

4. André Neher underscores that prophecy should not be reduced to prediction (1969). Ian Balfour suggests that prediction "is but one among many of the rhetorical forms and function of prophecy" (2002:5). The focus, in this article, is on this particular form and function of prophecy, which is not its only form and function.

5. For the role of hype in contemporary biological research, see Brown (2003); Fortun (2008); and Sunder Rajan (2006).

American apocalypse was a plain-speaking man; candid, sincere, and naturally disposed to openly speak his mind. For some, his message was controversial, but the purpose was always the same: to communicate his perspective and expose the prevailing thought of the time, a thought that he considered to be irresponsible, even dangerous. The counter-prophet unveiled the false prophets who, in his view, deceived people intentionally.

But Palese is not only a counter-prophet with a message for the people; he is also a man with an Italian name, an Austrian accent, and an American career. Born in 1944 in Austria, he grew up in Linz, a city located in the north of the country, where his parents owned a local pharmacy. Before launching his career as a microbiologist at Mount Sinai, where he arrived as an assistant professor in 1971 at the age of 27, he followed in the footsteps of his parents and studied chemistry and pharmaceutical science at the University of Vienna. As was typical for his generation, Palese was never formally trained in what later became known as “molecular biology.” He learned the techniques that so fundamentally transformed biological research as they developed over the years. During his time at Mount Sinai he collaborated with his colleagues and developed an important method that allows scientists to practice reverse genetics with influenza viruses.<sup>6</sup>

One day in his office Palese suddenly stood up, walked to his desk, and removed a thick volume from one of the bookshelves. He began to search for an article that he had published in *Nature* in 1976 with his former colleague, Jerome Schulman. He promptly found it and presented it to me almost like a piece of evidence in some trial. On the article’s last page I noticed that a paragraph had been underlined heavily with pencil. In early 1976, Palese explained to me, a local epidemic of respiratory illness had unexpectedly erupted at a military training center in New Jersey. A systematic epidemiological investigation eventually revealed that some of the recruits had been infected with a type of influenza typically not found in humans but in swine. The surprising appearance of a “swine flu” virus in a densely populated area troubled public health officials in the United States. Faced with an infectious agent that seemed to have crossed the species barrier, experts argued that the nation was on the verge of a devastating pandemic with the potential to kill millions of Americans. President Gerald R. Ford, running for reelection, heeded the advice of his experts and announced an unprecedented immunization campaign in March 1976. The ambitious aim of the national campaign was to vaccinate some 200 million Americans against the infectious agent before the end of the year. The US Congress approved the program, pharmaceutical companies manufactured a vaccine, and clinical trials were conducted before flu shots were administered. When a growing number of severe side effects occurred that seemed to be linked to the immunization program, newspaper

articles began to raise questions about the vaccine’s safety. The program was stopped, the pandemic never materialized, and the public health campaign went down in history as a “fiasco.”

“I was skeptical from the start,” Palese told me while thumbing through his article. In the midst of the immunization campaign, in October 1976, Palese and Schulman provocatively argued that the “swine flu” virus was an unlikely candidate for the next pandemic (1976). A few months later, at the Gustav Stern Symposium on Perspectives in Virology in New York, Palese once again challenged his powerful colleagues’ prophetic pronouncements. He maintained that the puzzling appearance of the new virus at the military training camp represented, in all likelihood, an isolated incident. For many, Palese’s counter-prophecy was untimely and controversial; it stood in marked contrast to the majority of experts and was diametrically opposed to the opinion of respected scientist and influenza researcher, Edwin D. Kilbourne. A charismatic physician turned microbiologist, Kilbourne was an influenza researcher with a distinguished track record and prestigious awards for his achievements. He was also a principal adviser to President Ford’s immunization campaign. At the time, Kilbourne was Palese’s department chair at Mount Sinai. In a conversation with me, a former colleague remembered: “It seemed to us as if Palese and Kilbourne were working on opposite sides of Central Park.” Palese was eager to develop his career, and he did so successfully, succeeding Kilbourne as department chair eventually.

“The only mistake that was made in 1976,” the other pope, Webster, told me when we met in Hong Kong in February 2009, “was that the vaccine was made and then used.” According to Webster, “the vaccine should have been made and held ready in case the pandemic happened.” He added: “If you don’t have the vaccine ready and it happens, you’re responsible. Today we can’t take the attitude that it will not happen. We don’t have enough evidence to say that it won’t happen. And so you must go ahead and prepare. It’s like preparing for an earthquake. It will happen sometime.” Referring to the highly pathogenic H5N1 avian influenza virus that had been spreading throughout Asia, Webster underscored that the virus “has been out there for ten years. It’s trying it on. It hasn’t made it yet. We just don’t know. We certainly don’t know whether only H1, H2, and H3 can do it.” The latter reference was an allusion to one of Palese’s key arguments. Palese has suggested that only influenza viruses of the H1, H2, and H3 subtypes may be able, due to biological constraints, to transmit efficiently among humans and cause pandemics. But as his colleague and prophetic competitor, Webster, pointed out, despite a very detailed understanding of the history of pandemics in the twentieth century, archival records simply do not go back long enough in time to show that only these particular subtypes are able to infect humans. “It may take twenty years for the H5N1 virus to move from the wild bird reservoir and change and develop into a human

6. For a recent account of reverse genetics in microbiology, see Caduff (2012).

virus,” he maintained. But sooner or later it will happen, Webster said. The clock is ticking.

In the public debates that I observed, it was always Webster’s perspective that eventually prevailed. There seemed to be no place for Palese’s prophetic existence. His indubitable scientific authority as a pope of influenza stood in marked contrast with the marginal impact of his speculative facts, especially when it came to the crucial question of the pandemic threat. It seemed impossible for this prophet and his predictive message to be heard. It seemed impossible for his faith to have a place in reason. In February 2012, Palese drew my attention to a public debate organized by the New York Academy of Sciences. At issue was an influenza virus that had been manipulated in the laboratory. In the course of the debate, Michael T. Osterholm, a prominent US public health professional and Director of the Center for Infectious Disease Research and Policy at the University of Minnesota, became evermore irritated. He accused Palese of denying clear signs of danger and then declared: “What you’re saying is just propaganda.” And he added, “You do not represent the mainstream of influenzologists when it comes to this issue.” Palese, who was part of the panel, was frustrated by the talk. “You can always assume the worst,” he replied. “When do we stop being afraid?” The threat may seem unlikely today, but “we can’t afford to be wrong,” insisted Osterholm. People in the audience nodded. Only a few panelists disagreed with the public health professional and his gloomy vision of pandemic doom. In a political culture of fear, there is always a reason to be afraid.

The United States has, of course, a long and prominent history of apocalyptic thinking, which explains the cultural plausibility of the pandemic threat (Boyer 1992; Faubion 2001; Masco 2008; O’Leary 1994; Stewart and Harding 1999). The perpetual oscillation between natural disaster and technological salvation is indeed energizing in the Land of Promise (Haraway 1997; Helmreich 2009).<sup>7</sup> It is culturally plausible, politically effective, and economically beneficial. The speculative facts of dire prophecy also translate well into the conventional genres of media narration. Even so, such explanation is only partially sufficient, and it tends to remain somewhat general. To better understand why apocalyptic warnings about the pandemic threat were able to gain so much traction in scientific discourse and public debates, we must explore in more detail what I am calling a “cosmology of mutant strains.” As we shall see, at the heart of this cosmology is a temporal incongruity, which capacitates a certain kind of prophetic existence while it incapacitates others.

### Cosmological Considerations

“What is a virus?” I asked Anice Lowen one afternoon in the

laboratory. “It’s a mixture,” she said in response to my naive question about the virus sample that she and her colleague, Samira Mubareka, were using for their experimental research. Lowen was a postdoctoral fellow in the Palese lab at the time of my fieldwork between 2006 and 2008. In a series of elegant studies, which garnered public attention and were even covered in a *New York Times* article in December 2007 (Kolata 2007), Lowen and Mubareka were exploring, on the basis of their guinea pig model, the role of humidity, temperature, and radiation in the seasonal transmission of infectious disease (Lowen et al. 2006, 2007, 2008). “In a given sample,” Lowen explained, “you probably have millions of different variants because the influenza virus is very error prone.” The casual remark instantly reminded me that the rapidly mutating and relentlessly recombining virus was constantly making itself different from itself. Influenza viruses are known to make a lot of mistakes when they replicate, which can alter the biological properties of the virus and change the kind of hosts that it infects.

In a thoughtful contribution to a landmark publication on the nature of viruses, Kilbourne offered a series of reflections on the kind of entity that a virus might be. According to Kilbourne, a virus sample is commonly thought of as something homogeneous, but it actually represents a rather heterogeneous population. It really is, Kilbourne suggested, “a statistical consensus of a genetically heterogeneous population . . . in constant flux” (1993:294). What Lowen used for her experimental study in the lab and what she called a “mixture” in response to my question was, in Kilbourne’s terms, a swarm of diverse creatures caught in a process of permanent variation. As I learned from my interlocutors in the lab, a virus sample inevitably consists of multiple variants that are relentlessly replicating, mutating, and recombining, even in the test tube. Microbiologists, in other words, are working with an ephemeral entity that lacks the necessary means to maintain a stable biological form. Celia Lowe phrased it nicely when she observed that viruses exist in a “state of indeterminacy” with respect to the forms that they generate (2010: 627).

As I realized in the course of my fieldwork, the perception of viruses as indeterminate entities is common sense among influenza researchers. It developed over the past few decades, solidifying into a powerful discourse that has fundamentally reshaped the way a growing number of experts worldwide approach infectious diseases. In the late 1980s and early 1990s a group of influential American biomedical scientists and public health specialists argued that infectious diseases were likely to surface in the near future. Coined by epidemiologist Stephen S. Morse, the seminal concept of “emerging viruses” was officially launched in May 1989 at a high-profile conference in Washington, DC, sponsored by Rockefeller University, the National Institute of Allergy and Infectious Diseases, and the Fogarty International Center (Altman 1989). Morse and his colleague, Nobel Prize-winning microbiologist Joshua Lederberg, convened more than 200 participants to the sci-

7. “Belief in advancing disaster,” writes Donna Haraway, “is actually part of a trust in salvation, whether deliverance is expected by sacred or profane revelations, through revolution, dramatic scientific breakthroughs, or religious rapture” (1997:41).

entific meeting in order to discuss their concerns about the relentless evolution of pathogenic agents that seemed to account for the growing number of outbreaks observed around the world, including, most importantly, the devastating spread of HIV/AIDS (Krause 1998; Lederberg, Shope, and Oaks 1992; Morse 1995). These concerns, as it turned out, were shared by many a scientist and, over the next decades, were frequently repeated by journalists.

Historian of medicine Nicholas King has underscored that the tremendous success and popularity of the concept was largely due to two American journalists, Laurie Garrett and Richard Preston (King 2002, 2004). Garrett, a former National Public Radio and *Newsday* correspondent, conducted extensive research for a book project on the recent appearance of a set of known and unknown infectious diseases while she was a fellow at the Harvard School of Public Health in the early 1990s. Upon learning that her colleague, Richard Preston, was working on a similar manuscript, Garrett intensified work on her rapidly growing publication in order to release it at the same time. In 1994, Garrett's *The Coming Plague* and Preston's *The Hot Zone* were published almost simultaneously to great public acclaim (Garrett 1994; Preston 1994). The two books instantly hit the best-seller lists. Joining Tim LaHaye's popular *Left Behind* series and its apocalyptic account of the world's dramatic end, Garrett's and Preston's publications coincided with the ascendancy of dispensationalism as a theological trend among American evangelicals.<sup>8</sup> The two "non-fiction" best sellers established the apocalyptic imaginary of a vulnerable nation threatened by an obscure mix of dangerous pathogens lurking in the rain forests of faraway countries. As King points out, the discourse of emerging infectious diseases has been so powerful the past few years because it is "tremendously flexible, allowing a wide variety of actors to adopt it, molding small parts or emphasizing particular elements and downplaying others to suit their own purposes" (2002:768). The discourse furnishes actors "with a consistent, self-contained ontology of epidemic disease: its causes and consequences, its patterns and prospects, the constellation of risks that it presents, and the most appropriate methods of preventing and managing those risks. It comes equipped with a moral economy and historical narrative, explaining how and why we find ourselves in the situation that we do now, identifying villains and heroes, ascribing blame for failures and credit for triumphs" (King 2002:768).

Experts underscore that many factors are responsible for the spread of infectious agents and the emergence of unknown diseases across the world (Culliton 1990; Krause 1992; Morse 1993; Osterholm 2005; Satcher 1995). An influential report, *Microbial Threats to Health in the United States*, published by the Institute of Medicine, foregrounds changes in human demographics and behavior, technology and industry, economic development and land use, and international travel

and commerce as crucial elements that have contributed to the emergence of new infectious diseases (Lederberg, Shope, and Oaks 1992). With a focus on the unpredictable interactions of social, cultural, political, and biological factors, the textual productions and technical interventions around emerging infectious diseases provide an account of modernity's dark side, resonating with more general concerns about the critical condition of the environment. The discourse of emerging infectious diseases thus intersects with a broad range of other discourses, practices, and affects. Emphasizing the flexibility and mutability of the discourse, Frédéric Keck argues that it has morphed into a myth (2010a:298). The myth foregrounds biopolitical insecurities: "unrecognizable aliens capable of disrupting existing immunities, penetrating once-secure boundaries at a time of deregulated exchange," as Jean Comaroff observes (2007:198).

The result of these biopolitical insecurities is a present increasingly experienced as a time of crisis. According to Lauren Berlant, crisis is a genre "rhetorically turning an ongoing condition into an intensified situation in which extensive threats to survival are said to dominate the reproduction of life" (2011:7). The genre of crisis generates "a state of animated and animating suspension that forces itself on consciousness" (5). This state of animated and animating suspension is at the core of the cosmology of mutant strains. What the cosmology foregrounds is the ever-changing, ever-evolving nature of microbial organisms. There is no end to the mutation of these organisms, and the future of their evolution remains unforeseeable and unpredictable. Emerging viruses are able to trigger epidemics that end quietly or that return with a vengeance. They are constantly reinventing themselves in response to the antiviral treatments that have been developed over decades. The microbes strike back, "and yet we can never be sure when and how it will happen," as Melinda Cooper notes (2006:117). The microbes challenge the scientific knowledge on which today's most effective treatments are based. The mutant strains are constantly evolving and adapting, and they will therefore always be one step ahead. They change rapidly, spread instantly, and become evermore dangerous. Yet who is most at risk is unknown.

In the cosmology of mutant strains, disease is unpredictable, understanding improbable, and treatment unavailable. Truth itself is kept in a state of suspension. Experts are destined to be ignorant, at least in part, because nature always appears to be one step ahead, cooking up a new virus that does not even have a name. And once it has been given a proper name and a proper place in an expanding genealogy of microbial descent, the virus mutates and recombines, making itself different from itself again. The next new virus and the next new disease are already in the offing.

At the heart of the cosmology is thus a temporal incongruity. Nature has advanced and is already one step ahead. Experts, by contrast, are behind and always belated. Experts are permanently struggling to keep up with nature's eternal evolution. The cosmology of mutant strains has forced experts

8. My thanks to Gerasimos Makris for his reference to the *Left Behind* series.

to accept a certain kind of temporal incongruity at the heart of their profession, making it impossible for themselves to accomplish the daunting task of “achieving simultaneity with the present moment,” to borrow Miyazaki’s phrase (2003: 255). It comes as no surprise, then, that the temporal incongruity, which has taken shape between the object and its knowledge, has generated an intensified situation of anxiety and apprehension at the heart of reason.

What this temporal incongruity reveals is a striking affinity with a prominent concept of prophetic time. In religious discourse, observes Jane Guyer, the present is perceived as a “gap, a space, a rupture in time that cannot and should not be mediated” (2007:415). Thus, living in the present means living in the “time that remains” (Agamben 2005; Benjamin 1991; Taubes 1991). The gap cannot be known, it can only be “endured by waiting, by identifying, by witnessing” (Guyer 2007: 415). Time is arrested, but “fantasy flourishes” (Aretxaga 2002:141). Similarly, in the context of preparedness, the present is perceived as a gap in time before the next pandemic strikes. But how much time is left? How much time is left to prepare and be ready? The viral storm “could happen tonight, next year, or even ten years from now” (Osterholm 2005:36). Drawing on Miyazaki’s insight, it seems that the suspension of truth, in the time that remains, has produced a new possibility for the recalibration of faith and reason.

And such recalibration has indeed occurred in the cosmology of mutant strains. A powerful place for expertise has appeared in the late liberal government of bodies and populations. The temporal incongruity has become a pragmatic opportunity for the speculative facts of pandemic prophecy. Taking advantage of this opportunity, experts have extended their perspective beyond the domain of science, urging people to prepare for the unexpected. “If humans are to survive the inevitable ‘counter-strike’ from microbial life . . . we need to prepare for the unexpected; learn to counter the unknowable, the virtual, the emergent,” writes Cooper (2006:117). In today’s cosmology of mutant strains, a certain absence of knowledge is accepted as the normal and natural result of an inevitable temporal dissonance. For the infectious-disease specialists and public health professionals I worked with, this absence had become a self-evident fact, reflecting the temporal disjuncture of a natural evolution that is always ahead of the curve and a scientific understanding that is always behind. What the normalization and naturalization of this absence has enabled is an intensive circulation of scientifically inspired prophetic messages, which leap across the gap that has opened up between the object and its knowledge. Experts are allowed to have faith in reason (again). Pandemic prophecy thus marks a prominent place where faith dwells in reason today.

And so, the temporal incongruity has not undermined the possibility of expertise. On the contrary, the temporal incongruity and its dramatization have created powerful arbitrage opportunities for the circulation of speculative facts. These arbitrage opportunities have become an important source for a certain kind of expert agency, which leads us from the

cosmology of mutant strains to an examination of the ethics of harmful consequences.

## Ethical Elaborations

During a press conference at the headquarters of the World Health Organization in Geneva, Keiji Fukuda, the Special Adviser to the Director-General on Pandemic Influenza, addressed charges that the health organization exaggerated concerns about the swine flu virus in 2009. Confronted with allegations that the health organization manufactured a “false pandemic” and thus provided pharmaceutical companies with a splendid opportunity to promote their products, expand their markets, and grow their profits, Fukuda underscored that all experts were required to declare their financial interests. In his comments Fukuda rejected assertions that the health organization overstated the significance of the unexpected emergence of the virus in 2009. The WHO had not encouraged public health professionals to use “a sledgehammer to crack a nut,” as one commentator provocatively phrased it (Laurance 2010).

“No one can know how bad an epidemic or pandemic will become until it is largely too late to do anything about it,” a WHO spokesperson maintained. At the outset of the pandemic, “when the public health authorities around the world were dealing with this situation and facing many unknowns, this is when they had to make a lot of decisions about what to do,” explained Fukuda. “And this is when many of the hardest decisions were coming up during the pandemic. So I think that, in general, what health authorities, including WHO, most strongly hold forth as the most important goal is to make sure that everything can be done to protect people from harm. So in this situation, I think that this is an application of the so-called precautionary principle: prepare for the worst and hope for the best.” Health authorities have to err on the side of caution, Fukuda emphasized.

Over the past decades, the principle of precaution has often been referred to in relation to issues concerning the protection of the environment, and increasingly to the protection of human health as well. Recourse to precaution is believed to be warranted when scientific information is considered insufficient, inconclusive, or uncertain. Precaution, in other words, is a political technology of risk management in a situation in which risk assessment is inconclusive or impossible and in which potential hazards might entail catastrophic consequences for human health. In situations where truth is suspended, the principle of precaution requires authorities to consider the worst imaginable case as the most likely scenario. Precaution thus enables actors to commit a leap of faith. It allows them to have trust in a particular kind of future, even if there is no evidence that this future is likely to materialize.<sup>9</sup>

9. According to Ewald, the principle of precaution “invites one to make the most deceptive malicious demon one’s constant companion” (2002:289).



Precaution amounts to a reaffirmation of agency and sovereignty in a world of science where truth is suspended. In cases in which scientific evaluations preclude a full and final calculation of probabilities, or in which such an evaluation appears to be impossible, the principle of precaution enables decision makers to proceed and intervene even if the risk in question has not been determined.<sup>10</sup> Faced with an unknown future and uncertain probability calculations, the decision to proceed and intervene becomes an eminently political one, even if it does not appear as such. “In the face of major large-scale threats like those to human health from avian and pandemic influenza, there is little controversy around some role for precaution as a possible normative presumption in risk management,” note Andy Stirling and Ian Scoones (2009).

The World Health Organization has officially adopted a precautionary approach, which requires public health officials to “prepare everybody for the worst and hope for the best.” This approach has become a key element in a more general ethics of harmful consequences. Time and again, experts and officials told me that “it’s better to be safe than sorry” and that they have no choice; “we always have to err on the side of caution.” When there is uncertainty, or disagreement, “it is only responsible to plan for the possibility that the optimists are wrong” (Schnirring 2012). “If you don’t have the vaccine ready and it happens, you’re responsible,” Webster reminded me in Hong Kong. Thus, precaution must be situated in relation to the more general problem of legal as well as moral responsibility. Significantly, responsibility appears here in the form of an anticipation, an “anticipation of retrospection.”<sup>11</sup> This anticipation of retrospection creates a certain anxiety among experts and officials. Precaution refers to a moment in the future at which an endpoint is given and a judgment is made retrospectively. This retrospective judgment is anticipated in the present. “Someday, after the next pandemic has come and gone,” Osterholm suggested, “a commission much like the 9/11 Commission will be charged with determining how well government, business, and public health leaders prepared the world for the catastrophe when they had clear warning. What will be the verdict?” (2005:37). Emerging on the horizon is thus not just the next pandemic but also the next commission. What will be the verdict? Borrowing from Elizabeth Povinelli, we might say that the present is “interpreted from the point of view of a reflexive future horizon”

10. Precaution thus implies that conventional political action is always based on certain knowledge. Bruno Latour rightly contests this claim. “L’idée que le passage à l’acte provienne d’une connaissance complète de ses causes et conséquences est une aberration. Tout général, tout capitaine, tout caporal sait bien que l’action consiste à sonder, à explorer, à tâtonner pour produire à la fois des informations sur la localisation et sur les intentions de l’ennemi et pour forcer le destin en prenant, quand on le juge nécessaire, des risques jamais exactement calculés qui obligent de ce fait à une vigilance continuelle laquelle, à son tour, permettra de suspendre l’action, de battre en retraite ou, au contraire, de pousser son avantage” (Latour 2000).

11. I borrow the phrase “anticipation of retrospection” from Miyazaki (2003:259).

(2011:3). According to Povinelli, the future anterior constitutes a temporal structure distinctive for the government of bodies and populations in late liberalism. Events in the present are judged in relation to what will have been the outcome of these events “from the perspective of a future interpreter” (3). The present is thus increasingly perceived from a point in time in which a future will have happened and in which a retrospective judgment will be made. Precautionary action allows actors to leap over the gap that has opened up between the present moment of decision and the future moment of judgment. The temporal incongruity between these two moments threatens the agency of public health actors and public health institutions. Precaution allows these actors and institutions to prepare for the next audit and be ready for the day of judgment.

In the context of precautionary action, expecting the unexpected has increasingly mutated into presuming the worst. It comes as no surprise, then, to see a certain kind of prophetic existence capacitated at the intersection of the cosmology of mutant strains and the ethics of harmful consequences. The prophet’s apocalyptic message has become culturally plausible and institutionally compatible. The speculative facts of dire prophecy express today’s faith in the worst case. Meanwhile, prophetic messages that are less dire are systematically kept below the threshold of reason and exposed as “propaganda.”

Even though precaution is often referred to as a “principle,” there is considerable disagreement about what it actually means; different versions exist, and new definitions are proposed on a regular basis. The “principle” is clearly entangled in larger contests over agency, sovereignty, and responsibility. It would be mistaken, therefore, to call “precaution” a political rationality; it may not even amount to a coherent “principle.” From an anthropological point of view, it seems more productive to follow Greenhouse’s lead and analyze precaution as a site of contest where the “distribution of agency across social space” is at stake (1996:82). Entangled in these struggles over the unequal distribution of agency, precaution equates intervention with “safety” and “security.”<sup>12</sup>

Considerations of precaution result not in less science, less knowledge, and less intervention, but more. François Ewald and his colleagues thus propose to analyze precaution as a “giant machine for the production of knowledge; of knowledge in respect to what we know as well as of knowledge in respect to what we don’t know” (Ewald, Gollier, and de Sadeleir 2001:47). Precaution, in other words, produces knowledge about the unknown. The aim of the machine is not to reduce the realm of the unknown but to know more about it. In so doing, it expands the power of the speculative fact. Precaution responds to a temporal incongruity and enables a leap of faith beyond all proof, encouraging people to have faith in the worst case, however unlikely it is.

12. For an account of contemporary states of emergency and the logic of intervention in the field of humanitarianism, see Fassin and Pandolfi (2010).

## Conclusion: The Known, the Unknown, and the Taken-for-Granted

Over the past years, anthropologists, sociologists, and historians have drawn attention to the significance and relevance of the unknown for our social, cultural, and political lives (Dilley 2010; Geissler 2013; McGoe 2012a, 2012b; Proctor and Schiebinger 2008; Riles 2006; Taussig 1999). Peter Galison has termed this interest a concern with “antipistemology,” by which he primarily means a scholarly investigation of the systematic ways in which knowledge is “covered and obscured” (2004:237). Linsey McGoe has pointed out that attention to strategic unknowns calls for “a subtle shift in the epistemological gaze that seeks to offer non-knowledge its full due as a social fact, not as a precursor or an impediment to more knowledge, but as a productive force in itself, as the twin and not the opposite of knowledge” (2012a:3). McGoe also has underscored that such a focus on strategic unknowns effectively undermines the modern tendency to value the known over the unknown and equate knowledge with power.

The cosmology of mutant strains has encouraged experts to accept the unknown as an inescapable reality. In today’s world of emerging viruses, the unknown is considered an ontological given. The object will always be ahead of its knowledge. It is impossible to predict how a virus might evolve; it might trigger a pandemic, or it might disappear again, experts argue. In the cosmology of mutant strains, the unknown has become a banality, inscribed in the nature of reality. Taking this reality for granted, the principle of precaution has enabled experts and officials to respond to the suspension of truth, believe in the speculative fact, and prepare for the worst, in the time that remains, even while hoping for the best.

If the cosmology of mutant strains has made the normalization and naturalization of the unknown possible as an ontological given, the ethics of harmful consequences has allowed experts and officials to transform this reality into a source of power for the late liberal government of bodies and populations. Precaution is both a knowledge machine and a power engine. It is a knowledge machine producing evermore knowledge about the unknown, and it is a power engine converting obstacles to action into opportunities for intervention. As a knowledge machine and a power engine, precaution has significant implications also for the prophetic existence, which is to say, for the possibility to have faith in reason today. Precaution has become a solid ground for dire prophecy and the thrill of terror, allowing experts and officials to commit a leap of faith and proceed as if the most frightening scenario was about to come true. In the political economy of disaster capitalism it is always better—ethically, politically, economically, and institutionally—to assume that the apocalypse is nigh.

Let me raise, in conclusion, a fundamental question. How might we, as anthropologists, respond to the ascendancy of precaution as a powerful source of agency that capacitates a certain kind of prophetic existence while incapacitating oth-

ers? In what sense might it be possible for our scholarly work to escape the knowledge machine and power engine of late liberalism? Must we chastise ourselves for our “stubborn refusal” to interrogate the unknown, as Linsey McGoe proposed (2012a:3)? Must we also admit that we have been living in a state of darkness all these years? Yet what is the point of interrogating the unknown in the first place? What is the point of knowing more about it?

My sense is that anthropologists might have a much more effective operation at hand, an operation that functions outside the dialectics of the known and the unknown. What I suggest is that for anthropological inquiries into the relationship between the known and the unknown we ground them in a concern with the taken-for-granted. This concern has been theorized in many ways, and it has deep roots in the discipline of anthropology. The point is not to know more about the unknown. The category of the taken-for-granted escapes those dialectics. The taken-for-granted neither refers to that which is known or true nor to that which is not known or not true. The taken-for-granted is both visible and invisible; it is invisible precisely because it is hyper-visible. It is obvious, palpable, and hence unremarkable. The taken-for-granted “goes without saying.” It is “common sense.” It is embodied in the habitus of the actor and materialized in the structure of the field (Bourdieu 1977, 1984). As a social sediment, it can become hegemonic and give force to and enforce “one matrix of interpretation rather than another” (Povinelli 2012: 4). As a crucial concern animating the discipline, the category of the taken-for-granted escapes the dialectics of presence and absence, and it thus allows scholars to side neither with the known nor with the unknown. We might term it anthropology’s way of placing a wedge in the mechanics of power.

Prophets such as Robert Webster and Peter Palese are masters of the dialectics of presence and absence. Turned toward the future, they claim to see what others cannot see. It is this unique ability that prompts people to place their lives into the hands of such experts, whose special abilities have endowed them with power, prestige, and authority.<sup>13</sup> However, from an anthropological perspective it is not only important to explore how these prophets and their predictions stand at the threshold between the known and the unknown. It is just as essential to examine the taken-for-granted assumptions that are produced alongside these dialectics. Which interpretations are enforced?

In a 2005 book dramatically entitled *The Monster at Our Door: The Global Threat of Avian Flu*, journalist and political activist Mike Davis declared that the “essence of the avian flu threat . . . is that a mutant influenza of nightmarish virulence . . . is searching for the new gene or two that will enable it to travel at pandemic velocity” (2005:8). Davis, too, is a

13. For a classic ethnographic account of oracles, see Evans-Pritchard (1937). On Nuer prophecy, see Evans-Pritchard (1956). See as well Ardner (1989) and Sundkler (1948). For a more recent analysis of prophecy, see Spencer (2003).

prophet of doom; he subscribes to the prevailing cosmology of mutant strains, observing that “influenza epidemics and pandemics usually emerge first in southern China . . . where huge numbers of pigs, domestic ducks, and wild waterfowl live in traditional ecological intimacy” (17). Opposing “tradition” to “modernity,” Davis invokes not only the cosmology of mutant strains, he also partakes in the replication of a nineteenth-century topography of disease that is located firmly in a European point of view. Clearly, and perhaps not surprisingly, this Orientalist topography of disease is also a moral “geography of blame,” to use Paul Farmer’s term.<sup>14</sup> Since the nineteenth century, European observers have claimed that infectious diseases always come from the East, threatening the “civilized world” of the West. For Davis it is a particular place in the East that is described in drastic terms as a dangerous breeding ground for the coming plague. The real “accelerators” of the deadly disease are the mega-slums of Asia. “The great concentrations of urban poverty in Dhaka, Kolkata, Mumbai, and Karachi,” declares Davis, “are presumably like so many lakes of gasoline waiting for the spark of H5N1” (2005:153). Paradoxically, says Davis, “disease surveillance and epidemic response are weakest precisely where they are most important: in the mega-slums of Asia and Africa” (2004). At the center of this scary scenario is a geography of blame that continues to accuse the impurity of a racialized Other for the spread of deadly bugs.<sup>15</sup> In Davis’s view, the mega-slums are “responsible for turning influenza’s extraordinary Darwinian mutability into one of the most dangerous biological forces on our besieged planet” (2005:8).

In March 2009, a new virus emerged, and a pandemic was declared, but the virus appeared not in the mega-slums of Asia or Africa. It appeared in the heartland of modern civilization, in southern California, where Mike Davis resides. Ironically, the “monster at our door” was literally at Davis’s door, but he could not see it because his eyes were fixed on the wrong spot.

The prophet probes the unknown and struggles to see what others cannot see. Yet there is something that even the prophet cannot see: what is hidden in plain sight.

## Acknowledgments

I would like to thank Thomas Kirsch and Roy Dille, organizers of the “Regimes of Ignorance” workshop at the University of Konstanz, Germany, where I presented a version of this article. Thanks for an inspiring discussion to the workshop organizers and the participants: John Borneman, Leo Coleman, Christos Lynteris, and Lilith Mahmud. My thanks to Maria José A. de Abreu, Nikola Bagic, Orkideh Behrouzan,

Anitra Grisales, Angie Heo, Cathy Herbrand, Karen Jent, Janina Kehr, Hanna Kienzler, Samuel Lengen, Gerasimos Makris, Claire Marris, Vinh-Kim Nguyen, Francisco Ortega, Salome Schärer, and Austin Zeiderman for comments and suggestions. Special thanks to Peter Palese, who has been a terrific interlocutor over the years.

---

## Comments

### Maria José A. de Abreu

University of Amsterdam, Stichting Het Spinhuis, Ouderzids Achterburgwal 185, 1012 D K Amsterdam, The Netherlands (m.j.deabreu@uva.nl). 9 VIII 13

Carlo Caduff describes two competing orientations toward future anticipation regarding pandemic threat. These two main orientations are personified by Dr. Robert Webster and Dr. Peter Palese, whom the press glosses as “the two popes of influenza.” While Webster relates to the future as the imminent—the indeterminate yet likely to happen—pandemic disaster against which it is necessary to activate systemic preparedness (more than actually to *be* prepared), Palese invests in demystifying the prophetic undertones of the kind. Instead of perceiving the future as the unknown that casts a shadow on the present, Palese chooses a more perspectival, enclosed vision of the future that situates the possibility of a pandemic in terms that stand open for comprehension, even prevention. From Palese’s standpoint, Webster’s rhetorical expertise engenders the kinds of apocalyptic pulp that underpins the United States’ ongoing culture of fear.

By exploring the place of prophecy in contemporary technoscientific discourse, Caduff expands analytical insight on the topical obsession with (un-)preparedness (Collier 2008; Lakoff 2007, 2008; Lutz 2001; Samimian-Darash 2013). The author approaches the phenomenon of preparedness in terms of the political economies that govern regimes of temporality that, as the example of Webster shows, increasingly situate causes in the future (de Abreu 2013; Povinelli 2011). This change in the logic of causation allows governance to suffuse infrastructures of the contemporary with the speculative unknown and, moreover, to do so by fostering an environment of crisis that paradoxically situates eventfulness within the time of the ordinary (Berlant 2011); hence Caduff’s foregrounded interest in the unknown at the intersection of science and prophecy. If the future, so it seems, is no longer what it used to be, and the event has become the temporal logic through which ordinary life unfolds, one will expect with Caduff a different configuration to emerge today involving the relation between knowledge, object, and practical power.

In his 1918 lecture titled “Science as Vocation” (1946), Max Weber explains how often scientific knowledge rests on a

14. Farmer (1992). Thanks to Lilith Mahmud for her suggestion to highlight the geography of blame here.

15. Thanks to Leo Coleman for reminding me here of Davis’s argument. For an account of SARS and stigma, see Kleinman and Watson (2006).

discrepancy between what we rationalize and our technical knowledge. As Weber's explanation exemplifies, most scientists will drive their vehicles without actually having the knowledge of the technical means that perform the service. "The increasing intellectualization and rationalization do not, therefore, indicate an increased and general knowledge of the conditions under which one lives" (1946:139). Accordingly, what makes reality disenchanting is not that we know how things work but rather that we know—or believe—that they work by some nonmysterious, explainable means. While we do not know what these things are exactly, we relate to them not as unknowns but as knowables (see also Benjamin 1996 [1916]).<sup>16</sup> It is in this sense that when Weber speaks of spirit (as in "spirit of capitalism"), he does not mean doctrine explicitly, even less so technical expertise. Rather, and more subtly, Weber is talking about a learned disposition that anticipates Bourdieu's notion of "habitus," one that allows subjects to perform actions not despite but because of the gap between experiential knowledge and technical know-how. Precisely this suppression of the forces at work, according to Weber, is what distinguishes the scientist from the "savage" who "knows incomparably more about his tools" and "this, above all, is what intellectualization means" (1946:139).

More recently, in his influential "Faith and Knowledge: The Two Sources of Religion and the Limits of Reason Alone" Jacques Derrida (1998) intensifies that discrepancy when he notes how our present techno-mediatic condition overwhelms our capacity to even know what we do not know.<sup>17</sup> The logic here is no longer, as in Weber, one of default (the knowables) but one of excess (the unknowables). This excess, however, sustains the idea that the technologies we create also create us (Carlson 2008; Naas 2009; Serres 1995).

Increasingly, then, knowledge exposes its mystical qualities. As it turns out, what must be intellectualized now are precisely the very latent forces that Weber once thought had to be repressed in order to disintegrate the mysterious. As Caduff suggests, this implies a tremendous epistemological shift regarding the relation between knowledge and object. Accordingly, knowledge's condition is increasingly organized not around circumscribable objects but around open-ended potentials. Conditions, however, are intrinsically temporal, as attested by the conditional ("if clause")—a powerful forum for the prophetic "strategic unknown." Importantly, in Caduff's analysis such temporalizing of knowledge does not derive from an external source but erupts from the material signifier itself: the mutant nature of viruses. The epistemological challenge that this study poses to us is, then, how much should one's object influence one's methodology? How does one develop a form of immanent critique that allows one to both be contaminated by, yet become immune to, vocabularies put forward by our informants? In Weber's lan-

guage, what kind of leap prevents science "from becoming unfaithful to its own presuppositions" (1946:143)? By presenting us with two dominant scientifically inspired prophetic proclamations, Caduff offers not only an entry point into our present condition but moreover of our present conditional. One may gesture critically toward more contextual background. Yet, the aim of this article is not one of scrutinizing how a certain expertise of the future has become manufactured within a scientific-media-political context but to address how expertise of, and about, the future itself is being constituted in an era when so-called facts are becoming all too inseparable from the worlds that provoke it.

---

### James D. Faubion

Department of Anthropology, Rice University, P.O. Box 1892, Houston, Texas 77251, U.S.A. (jdf@rice.edu). 14 VIII 13

The author has done a fine job of containing one current of a phenomenon of very expansive sociocultural scope. He has also done a fine job of accounting for the prominence of Webster and the marginalization of Palese. I agree with the author that the phenomenon of the crossover scientist—part researcher and part prophet, or some blurry mixture of the two—is a distinctively American phenomenon. Genealogical considerations, however, suggest that the distinction requires more qualification than the author gives it. They also suggest that Webster might not be quite the apocalypticist that he seems.

Broadly speaking, there is nothing new about having faith in reason. It is the hallmark of the Enlightenment—a thoroughly European affair (or ensemble of affairs). Moreover, it is arguable—and has been argued (see, e.g., Löwith 1949)—that some, perhaps many, of the tales that the Enlighteners wove were tales grounded in the genre of biblical apocalyptic with however secular a verbal overlay they provided them. The author perhaps gestures toward this in appending to his observation that experts are allowed to have faith in reason the parenthetical "(again)." I am not at all sure, however, that the parenthesis is appropriate. Granted, the leitmotif of Enlightenment wisdom was progress, and progress often in a plainly transcendental register. Progress these days does not fare so well—at least for those of us (putatively "postmodern") who are happy to declare it a myth. Granted as well, at least on the face of it, the author offers us the case of a prophet whose pronouncements are of doom. Yet, Webster clearly still has faith that scientific progress could be made in the face of the inevitable pandemics he imagines if only it were given the chance to do so (which is, of course, part of what the author seeks to highlight). I hear progress in a similarly minor—but definite—key in Palese's much more properly popish position as well. I am not expert on the subject, but everything I have encountered not merely in the way of histories

16. In Weber's terms, "the knowledge or belief that if one but wished one *could* learn it at any time" (1946:139).

17. For a more detailed analysis on this approach, see Carlson (2008).

but also of ethnographies of scientists and the sciences indicates in fact that scientists have never been and are not now post-modern, that from the Enlightenment forward they have consistently had faith that their various enterprises have had progress as their directive—and by no means in vain.

Webster is undoubtedly a purveyor of what commonly passes for “apocalypse.” Yet something more—and more technical—needs to be said about what marks his putative apocalyptic as distinctively American. I should underscore that I think it is distinctively American. Doom is central to it—precisely because doom is not the conclusive motif of apocalyptic. Together with the scholars he cites, the author tends to treat apocalyptic as being all and only about doomsday. Apocalyptic is in fact a soteriological genre, a genre of redemption (for some, if not for everyone). The version that the Puritans imported to America highlighted not doom, which they believed to have passed, but instead the redemptive end beyond it—building and then forever living in the City on the Hill. Technically, they were, if not Enlighteners, then “postmillennialists.” Webster sees a catastrophic Armageddon lying sometime ahead. His preoccupations are thus “premillennialist” (see Weber 1979:9–12). Or, to be more precise, they would be premillennialist were they to point beyond catastrophe to a definitive peace, a resolution of suffering in which “time will be no more” (see Rev. 10:6). But they do not—or at least the author’s own profile of Webster gives me no more impression that they do than do the other profiles that I have encountered on the Internet. Webster’s preoccupations point instead to a repetition of indefinite pace, rhythm, or duration, a constant recycling of catastrophe and remediation and catastrophe again.

It is a faith all right. That its articulation does not perfectly conform to apocalyptic is not, however, merely an academic matter. Premillennialists *stricto sensu* (anthropology knows them better as millenarians) are profoundly anti-institutionalist, as the historical and anthropological records both uniformly attest. And why shouldn’t they be? If catastrophe is going to strike tomorrow, why bother to go to work or keep one’s wardrobe in good order today? Why shouldn’t the duties of everyday life simply be cast behind? The temporality of Webster’s visions of the future is, in contrast, well suited to institutionalization. It serves well the chartering of enduring institutional arrangements whose purpose is always to prepare for the next round (whatever indeed being prepared might substantively entail), potentially *ad infinitum*, and whether the threat is a mutant virus or a terrorist cell or an iceless Antarctica. Just so, we can legitimately speak and think of a temporality of “late liberalism,” which is a thing of institutions and ongoing processes of institutionalization whose myriad agents would hardly care to see come to an end any time at all soon. Were its temporality genuinely millenarian, it would instead have to be spoken and thought of as a mere flash (a big and bright one no doubt) in the pan.

## The Arbitrage of Nonknowledge

**Steve Hinchliffe**

Geography, College of Life and Environmental Sciences, University of Exeter, Amory Building, Rennes Drive, Exeter EX4 4RJ, United Kingdom (stephen.hinchliffe@exeter.ac.uk). 14 XI 13.

Twenty years ago there was a debate on a newly identified disease of cattle (bovine spongiform encephalopathy, BSE, or mad cow disease). Famously, the British government played down any fears that this condition might cross to people and issued assurances that eating beef was safe. Scientific opinion on the lack of evidence for a species jump was mobilized, with scientists acting as “medieval prelates,” as though revealing an inalterable truth (Canon 1994:ix). Other scientists warned that the uncertainties surrounding the pathogenic disease agent meant that we could face a worst-case scenario of half a million human BSE cases a year. These prophets were effectively treated as mavericks and scaremongers, and their cosmology of mutable life was considered unhelpful. Compared to Caduff’s case of pandemic influenza, where prophets of doom are seemingly given more credence than those who suggest no alarm, we might be tempted to say that in recent decades we have moved from public science as “assurance” to a science of “dire prophecy.” And science studies scholars have started to realize that their object of concern has also moved on (another “temporal incongruity”). From attacking the false certainties of public science, we are now faced with the post-Rumsfeld world of “uncertainty as justification” for expensive, often dual-use and militarist, investments.

Caduff’s interrogation of the dynamics and relationalities of this new dire prophecy shows us where this has deposited us. Taking two practicing scientists, both with laboratory experience of the matters at hand, we are faced with a reversal of the BSE case. The current moment seems to provide institutional backing to those who are ready to turn virological risk, uncertainty, and indeterminacy into a hypertrophic social response. Moreover, as Caduff details, the “stock” of experts rises too. If BSE was a nadir for public science, the new prophets who make nonknowledge their currency have managed to resurrect a certain kind of authority.

Now, there might be all kinds of reason for these shifts. Obvious ones include the differences between a BSE controversy, with an export industry and a ministry for agriculture desperate to reassure others that their product was safe, and a pandemic controversy, where pharmaceutical industries can gain from quasi-state prepurchase agreements that relate to speculative public health threats. These political bioeconomies clearly matter. More subtly, though, Caduff splices together cosmology and governance to provide a complementary and convincing narrative for our predicament. Cosmology refers in this case to the now conventional sense that the (microbial) world is continuously different from itself, emergent and therefore unknowable. Truth in that sense is always in suspension, as Caduff puts it, and science is one step behind a

world in flux. This is the temporal incongruity between an object and its knowledge and is the source, Caduff argues, for an intensification of anxiety and apprehension. (In passing, the same might be said for the social sciences and anthropology. Indeed, “flu fighters” have comparatively recently discovered that when you model epidemics, you quickly come across the reflexive capacity that makes societies, their networks and movements, emergent too [Colizza and Vespignani 2010; Leach and Scoones 2013].) In any case, the new prophets emerge in this recalibration between faith and reason. This is the arbitrage, the hedged future or win-win of assuming the worst, and it is aided and abetted, Caduff reminds us, by the anticipation of retrospection or the fear of being held to account for not acting on virtual dangers. Arbitrage lies in the securitization of institutional and other futures and gives prophetic statements their power to draw together or assemble a threatened public.

This is a compelling story, beautifully told. But let me add three qualifiers. First, is it really always “better” in disaster capitalism “to assume the apocalypse is nigh”? Not so for climate change, one might suggest (Wynne 2010), although perhaps there are signs that this is changing as capitalization of speculative climate futures takes form. Even so, there is surely more heterogeneity in emergent biosocial phenomena (Lee and Motzkau 2013) than this analysis suggests.

Second, an extension to Caduff’s narrative is important, because hypertrophic security carries its own risks and costs. While Mike Davis’s book possibly tripped over a few common tropes of pathogenic blame geographies, it also warned of the paradoxical effects of that favored response to threat, enclosure. A major threat to public and animal health emerges from a food system that is being transformed in part in response to the pandemic emergency threat. Greater concentration, simplification, and enclosure may well be producing the conditions for its own emergency (Hinchliffe et al. 2013; Leibler et al. 2009). The task of social science, in this case, may be to shift the emergency from mutant microbes to the biosocial phenomenon we call a food system.

Third, I agree, I think, with the move to other kinds of knowledge practices, and to common sense, but this needs to be spelled out. As Gramsci warned us, common sense is both potential saviour and a possible source of inertia and threat (1971). The question might be, how do we assemble a common that is responsive to a world of nonknowledge? The answer will not, I agree, be based in the reaffirmation of agency and distanced expertise that Caduff traces. It may be in assembling, without trying to integrate, transdisciplinary practices and knowledges—listening and learning with those who understand health as always more than pathogenic mutations, as matters of bodies, infrastructures, and environments (Farmer 2004). The resources for this commoning may be in another cosmological treatise, one Isabelle Stengers has called “cosmopolitics” (2010).

### Frédéric Keck

Laboratoire d’anthropologie sociale, 52 rue Cardinal Lemoine, 75005 Paris, France (frederic.keck@college-de-france.fr). 10 XII 13

How is it that apocalyptic visions of the future have become dominant in neoliberal societies? Rather than invoking the forces of disaster capitalism, and without denying them, Carlo Caduff shows that rationality itself is at stake in contemporary debates about a catastrophic future. Observing experts in the microbiology of influenza and pandemic preparedness, he uses the heavily charged notion of “prophecy” to analyze how they produce faith in a determined future. Max Weber looms behind: prophecy is part of the process of rationalization if it is considered as a field where truth claims compete. Once admitted that there is no prophet without a counter-prophet, the question becomes, what is the common language of prophets, and how does it build a cosmology that provides a take on the future?

By focusing on two world experts of influenza, Caduff proposes an interesting shift from pope to prophet. Flu scientists use the word “pope” to describe the “spiritual power” of those who have such a universal view of flu viruses that they can advise public health authorities—understood as the “temporal power”—on how to prevent flu outbreaks through vaccination. But how could there be two popes in the same church? And how could popes fail in their truth claims? It is more appropriate to talk about prophets to investigate the social fabric of truth claims without reducing their pretensions to rationality and universality.

Caduff identifies a key element of the emerging infectious diseases worldview that accounts for its prophetic potential: the cosmology of mutant strains. If microbiologists work daily in their labs on “a swarm of diverse creatures caught in a process of permanent variation,” they have to bet on the mutations that will be pertinent in the public space outside the lab. The leap from the lab to public space is thus also a leap from the present to the future: what the scientist watches in the lab is a “temporal incongruity” that opens a potential for apocalyptic predictions. Playing on the analogies between ontology and psychology, Caduff writes about a “state of animated and animating suspension” in microbial life and in the minds of those who observe them.

Caduff does not talk about another leap or jump that occurs between animal species. His article deals with animated life and suspension of time as if life and time were a “continuous creation of unpredictable newness,” to borrow Bergson’s definition (1998, 26). But I believe with Lévi-Strauss that life has its discontinuities, marked by the genetic code, and that social categories make these discontinuities meaningful (Lévi-Strauss 1966).

Since my ethnographic research has been led with Robert Webster’s students in Hong Kong (Keck 2010b), my perspective on his truth claims is different from that of Carlo Caduff, who adopts the counter-prophetic mode of Peter Palese. After collecting thousands of flu virus strains in birds,

whose role as a reservoir he clearly established, Webster showed that the H5N1 virus identified in Hong Kong in 1997 was lethal because it went from birds to humans without going through the mixing vessel of pigs. The viruses on which Webster bet are those that successfully pass from birds to humans, causing catastrophic reactions in their immune systems. No strain is dangerous in itself, he shows, but only in a given environment. The question then becomes, which mutation will be successful in jumping the species barrier? And what are the mechanisms for this ontological leap?

I have described the “emerging infectious diseases worldview” as a myth for that reason (Keck 2010a). Following Lévi-Strauss, I conceive mythical thinking as a way to connect different elements of the environment through the knowledge of natural species. As Lévi-Strauss asked after Boas, we should wonder, why are animal species so important in the discourse on pandemics and other coming catastrophes (Lévi-Strauss 1966)?

One answer I have given, in a journal edited with Andrew Lakoff (Keck and Lakoff 2013), is that animal species play the role of sentinel devices that make visible an invisible threat, because the difference in their organization acts as anticipation of the effects on humans. Sentinel devices play a critical role in preparedness: they stand on the border between the visible and the invisible, between the known and the unknown. They equip prophetic claims with means to act on the environment.

When Carlo Caduff defines the critical role of the anthropologist as the analysis of the taken-for-granted in prophetic truth claims, my feeling is that he confounds precaution and preparedness. Precaution maximizes the risk but is still expressed in the language of probabilities, while preparedness pushes the language of risk at its limits and is expressed more in images and scenarios. Images of dead animals play a key role in the faith we have in a coming pandemic.

Rather than prophets, I would finally describe microbiologists as shamans. Roberte Hamayon (2012) has shown that shamans play with the effects of a catastrophic encounter; they simulate its movements by displacing them in a fictitious space. I think that as anthropologists we need to defend shamans against forms of pastoral domestication: by collaborating with the game they play as “virus hunters,” we allow them to play better, that is, to provide us with better images of animals and the environment. This is where I would depart from Carlo Caduff’s critical position, even if I share his analysis of the ontology of viral mutations.

Carlo Caduff’s article is an interesting and very timely contribution to the social scientific analysis of the intricate historical and epistemological relationship between science and religion. Like the viruses at the heart of the prophetic warnings about our pandemic future, the connections between faith and reason in influenza science are both ever present and always evolving. What Caduff ultimately analyzes here is how the category of the unknown is used to construct a different form of expert authority. If knowledge is power, Caduff’s ethnography of the so-called popes and prophets of microbiology suggests that power now lies in predicting the future or exercising power on the basis of what one does not yet know. Power is less about knowledge here than about an artful twisting of uncertainty back into the shape of quasi-certainty. Scientists here deploy the trope of “precaution” in order to act now. Viruses may be “unpredictable,” but as I have argued elsewhere, it is unpredictability’s inherent predictability that increasingly sustains scientific authority in the twenty-first century (MacPhail 2010, 2014). This is the trick that helps to fuel the reigning paradigm of preparedness in global public health. It does not matter, in the end, which prophet is correct about the future. Having “faith” in public health is less about correct predictions and more about an overweening scientific belief in the inevitability of something happening. In my own wanderings through epidemiological terrain during the 2009 H1N1 pandemic, I often heard the adage “not if, but when” repeated like a liturgy.

Faith, in Caduff’s framing of it, is merely another way of talking about the much older problem of induction. Does science work by creating hypotheses and then deducing facts from the evidence, or, does science work by doing quasi-random experiments and then using specific observations to generalize and discover “facts” in order to support a reigning scientific paradigm? The answer is: both. In other words, scientists like Robert Webster and Peter Palese find the signals they are looking for, but that does not necessarily mean that all their facts are speculative. As a concept, “risk” denotes a situation where the probabilities are calculable and the danger is well defined (Callon, Lascoumes, and Barthe 2009:19–21). Uncertainty, on the other hand, does not lend itself to easy quantification or organized study. Why? Because you cannot study what you cannot know; the uncertain is the unknown and vice versa. But, and as Caduff points out, the admixture of risk and uncertainty in the future tense is a potent one. Time, as it were, is of the essence in influenza science in more ways than one.

Experts in Caduff’s rendering of the “cosmology of mutant strains” are those scientists and journalists who become adept at pandemic time traveling. The pandemic past is, arguably, more important to the pandemic future than the present state of influenza science; anxieties around the possibility of a repeat of the pandemic of 1918 drive much of the apocalyptic side of flu prophecy. In my own experience, and echoing Caduff’s observations here, epidemiologists and virologists often track back and forth in time to better explain their

---

### Theresa MacPhail

John W. Draper Interdisciplinary Master’s Program in Humanities and Social Thought, New York University, 14 University Place, New York, New York 10003-4589, U.S.A. (tmm260@nyu.edu). 6 XII 13

actions in the present (MacPhail 2014). One is required to be able to predict the future in order to claim expertise in public health. Indeed, the fact that the predictions of the two popes are qualitatively different never contradicts the importance of prediction itself. In other words, while influenza experts may disagree on the meanings of scientific data on flu, they share a similar *doxa*, or set of beliefs about the importance of continued research. In my own framing, Peter Palese is a “heretic” scientist because he disagrees with the orthodox viewpoint on the dangers of viruses like H5N1 or H7N9 (MacPhail 2014). But as Irving Goffman suggests, heretics are able to cause trouble precisely because they are part of the prophecy team in the first place (1959:83). Even if their predictions threaten another expert’s authority, they never threaten the system writ large. The underlying scientific paradigm is, to use Caduff’s conceptualization, always taken for granted.

## The Fallacy of Prophecy

**David Napier**

Department of Anthropology, University College London, Gower Street, London WC1E 6BT, United Kingdom (d.napier@ucl.ac.uk).  
29 XI 13

In Balinese cosmology the world of experience is divided into *sekala* (what you can see) and *niskala* (what you cannot). The distinction has little to do with the visible and the invisible, for this principle is not only recursive but also concentric: as knowledge increases, one’s awareness of what one cannot know increases equally. The more you think you know, the more you must acknowledge your true ignorance.<sup>18</sup> The certainty of prophecy is, in other words, by definition limited.

Unlike in science, this view makes evolution’s moral allegory and preparedness teleology irrelevant, because the future can manifest itself diversely as one moves from local experiences across ever-expanding cosmic spheres. Like a stone dropped in water, the disappearing catalyst creates ripples over an ocean of time. In such a cosmos, the paths one might take from that central point are infinite. Even the waves that stop the progress of those ripples as they hit against the shoreline actually curl back on themselves recursively.

For the Balinese, there are, then, multiple potential futures. It is folly to think that we can know which one will be ours. No single journey can have priority over another, even though we prioritize the life we know and live because we think we see it better. Prediction is only a gamble—something gamblers do better than scientists.

In like manner, Carlo Caduff’s argument moves by way of brilliant divagations on the cybernetic feedback loops that

reshape and stabilize unstable domains of meaning, allowing us to accept the recursive significance of those things we simply take for granted (Napier 2013b). Whether we label these shared assumptions social facts (Durkheim), cultural categories of thought (Needham), or the human habitus (Bourdieu), the name matters less than the importance of recognizing that we can never know completely the taken-for-granted assumptions we presume are universally real.

The relevance of this kind of “not knowing” is seen not only in the rise in what I call “disaster play”—the way in which governments in particular attempt by play acting to prepare citizens for the unexpected through enacted disaster responses (Napier 2013a)—but the value of ignorance as a driver of apprehension and fear is also seen vividly and more profoundly in the philosophical consideration of what we might call the “downside of empiricism.”

Let us consider briefly Bertrand Russell’s great example of the problem of inductive knowledge—the disaster of the chicken going to slaughter. Against Caduff’s prophets who search for the patterns of the catastrophic—against, that is, a faith in what Taleb has called the “unconditional benefits of past experience”—Russell’s example demands a question: “How can we know the future given knowledge of the past; or, more generally, how can we figure out properties of the (infinite) unknown based on the (finite) known?” (Taleb 2010:40).

“Consider a turkey that is fed every day. Every single feeding will firm up the bird’s belief that it is the general rule of life to be fed every day by friendly members of the human race ‘looking out for its best interests,’ as a politician would say. On the afternoon of the Wednesday before Thanksgiving, something *unexpected* will happen to the turkey. It will incur a revision of belief. . . . What can a turkey learn about what is in store for it tomorrow from the events of yesterday? A lot, perhaps, but certainly a little less than it thinks” (Taleb 2010:40).

This is what is worrisome about “prediction”—that is, scientific betting: it tells you mostly about what you can already know, and it makes you feel falsely secure about that. The turkey “felt increasingly safe even though the slaughter was more and more immanent” (Taleb 2010:41)—even to the point where (like economists and the press before the junk loan crisis) “the feeling of safety reached its maximum when the risk was at its highest!” (41). So what do we do? As Caduff says, we place faith in the prophet: in fact, “faith . . . operates at the heart of reason, not at its limits or margins.”

The events that change the course of human history—stock crashes, plane crashes, terrorist events, cyclones, earthquakes, volcanoes, great wars, mass migrations, infections, epidemics—all make the biggest impact precisely when the flow of events is at odds with our empirical practices. In fact, the importance of those events stands in a direct inverse relationship to what we understand to be happening—that is, to knowledge. History gets most moved by ignorance, not by knowledge, and, like the turkey, the problem is not solved at all but, rather, is exacerbated by our use of predictive models

18. “A wise person knows that knowing inherently involves not-knowing . . . real wisdom consists in holding the knowing and the not-knowing in creative tension” (Kaufmann 2009:9).



that lull us into thinking we can reduce risk and control what we do not yet see. This is why catastrophe modeling works best when it predefines the disasters it purports to predict and also why it much resembles a form of play: because the true events that create the future are also those that most revise the past (Napier 2003:223–225, 252–253).

---

### Jerome Whittington

Asia Research Institute + Tembusu College, National University of Singapore, Science and Technology Studies (STS) Cluster, 469a Tower Block, Singapore 259770 (jwhittington@nus.edu.sg). 26 VIII 13

Let me start by posing a question that I was unable to answer fully from Carlo Caduff's text. Are the two scientists whose discourse he chronicles—the two popes, as he says, of influenza—equivalent? In some sense they are not: Robert Webster's prophetic words insert easily into a particular biomedical regime of preparedness organized around a risk-averse commitment to total precaution. Palese, on the other hand, whose practices remain comparatively unmarked in this article, runs a powerful and well-funded research lab while he plays the role of outsider critic to the WHO's programmatic approach to global biopower. So Palese can be characterized as a prophet, or even a pope? His words cited in the article less predict the future than play the skeptic to the bluff and hype of those who portend pandemic. He may be thoroughly convinced that a pandemic will not happen, but is that the same as taking on a prophetic register? It seems to me that, against future tellers like Webster, he argues for a different attitude to risk and bureaucratic power. Is not Palese more like Martin Luther to the global church of what Caduff rightly identifies as a precautionary machine? Let me try to explain why this matters.

Caduff's question revolves around the modes of public discourse taken up by prominent scientists whose expertise deals with the possibility of a pandemic arising from deadly mutations to influenza virus strains. He situates Palese and Webster at opposing poles of a debate about the degree of risk posed by potential mutations and describes their voice with extended reference to America's "long history of apocalyptic thinking." Anthropologists have done a fair amount of work on the symbolism and structured temporality of apocalyptic thinking, which traffics well between religious and secular domains especially with respect, in the latter case, to large-scale crises. Caduff argues a largely culturalist position concerning temporality in the context of institutional authority: "In situations where truth is suspended, the principle of precaution requires authorities to consider the worst imaginable case as the most likely scenario. Precaution thus enables actors to commit a leap of faith. . . . Precaution allows these actors and institutions to prepare for the next audit and be ready for the day of judgment." In other words, the rise of

a bureaucratic culture of total risk aversion, especially in the World Health Organization, prepares the groundwork for prophetic discourse in which the presumption of inevitable pandemic decisively frames activity in the present.

At the core of Webster's position is a major tension between his policy of total risk aversion, upon which his prophecy rests, and his practice of what appears to be more-or-less bald opportunism. Webster argues that the end is nigh while buying stock in the prestige economy of salvation. Caduff argues that "prophets such as Robert Webster and Peter Palese are masters of the dialectics of presence and absence," but in Palese's case the dimension of practice seems totally different. He is described somewhat summarily as having a powerful and prestigious research practice at Mount Sinai School of Medicine revolving around the innovation of a specific and important technology, reverse genetics. If I understand correctly, his research partly concerns assessing past epidemics by reverse engineering the viruses that caused them. In Caduff's telling, we certainly get to know his view on the hazards of mutation, but nowhere does he occupy the media spotlight in the way that Webster does. Perhaps with good reason: what kind of prophet studies the previous cataclysm to claim that the future does not look so bad after all?

What gets downplayed in Caduff's cultural analysis is an in-depth engagement with these researchers' scientific practice qua future predictions. Pertaining to climate change, which is my field of study, remarkable effort has gone into developing emergent techniques for assessing risky futures. For all of anthropology's critiques of the authority function of expertise, the challenge right now is to assess how practicing scientists are often deeply critical of prophetic certitude. Climate science does not promise the end of the world; rather, it articulates a variety of reasoned, imaginative modes of apprehending pervasive and dangerous transformations (see, e.g., Whittington 2013). One can identify, distinct from the work of establishing authoritative facts, materialist practices of speculation characterized by a generative orientation toward uncertainty, a willingness to manipulate relations to see what happens, and a kind of play or recklessness. It is true that climate change has its prophets—James Hansen is the most well known in the United States—and climate scientists have not adequately developed a repertoire for stimulating public concern without announcing the closure of the End. But scientists demonstrate all sorts of imaginative, reasoned relationships to possible futures, and an apocalyptic sense of inevitability is only one of them.

---

### Austin Zeiderman

LSE Cities, London School of Economics and Political Science, Houghton Street, London WC2A 2AE, United Kingdom (a.zeiderman@lse.ac.uk). 2 XII 13

I am grateful to Carlo Caduff for his insightful and illumi-

nating essay. Its primary assertion—prophecy is central to the politics of pandemic preparedness in the United States—is both politically timely and conceptually rich. Caduff describes a specific historical conjuncture in American political culture and provides analytical tools for making sense of it. He is aware of the long history of apocalyptic thinking in the United States: fertile ground for the contemporary fetishization of foresight. But his target is the specific configuration of knowledge and power that allows prophetic enunciations about potential pandemics to gain traction in scientific discourse and public debate. “Pandemic prophecy” is paradoxical within an epochal account of modernity underpinned by the narrative of secularization (Koselleck 2004; Luhmann 1998). Caduff’s alternative is to examine the recalibration of faith and reason, of prophecy and prognosis, in late liberalism.

The essay asks what renders prophetic proclamations reasonable and authoritative, and why some enjoy more success than others. There is no singular prophetic voice here but rather competing, even diametrically opposed, future visions. We meet two prophets who disagree about the likelihood of a catastrophic pandemic—one promotes the urgent need to prepare for impending disaster; the other sees this as deceptive fearmongering backed by insufficient evidence. To what degree do their different styles of research lead these two scientists to disagree (the former is known for proposing that “viral sex” causes pandemics; the latter pioneered the field of reverse genetics)? Do the specific insights for which these scientists are known, and from which they derive their public visibility and prophetic authority, provide them with different temporal horizons and future visions? And while their relative success is determined by a prevailing public culture of fear, preparedness, and security, what role do scientific debates play in enabling the political voice of one prophet while disabling another?

Opposing prognoses notwithstanding, both figures deliver prophetic messages, cast in scientific terms, about future unknowns. Why, Caduff asks, is speculative expertise granted authority in contemporary scientific and public discourse? The crux of the matter is the “temporal incongruity” inherent to microbiological research: since viruses are always undergoing continuous mutation, nature appears perpetually one step ahead of science. This temporal incongruity, Caduff argues, has “generated an intensified situation of anxiety and apprehension at the heart of reason.” This situation demands and produces speculative knowledge, making prophecy the basis of political decisions, judgments, and interventions. But should we assume that such temporal incongruities always lead to anxiety? Is not the gap between what we know now and what can possibly know in the future internal to the scientific enterprise itself? And what about forms of temporal incongruity—in the domain of economic development, for example—that result in other affective states, such as excitement, desire, and hope? Why does this temporal gap between object and knowledge produce anxiety and apprehension?

Caduff identifies a second temporal incongruity haunting

the field of public health: when scientific information is considered insufficient, inconclusive, or uncertain, experts and institutions struggle to reconcile “the present moment of decision and the future moment of judgment.” As his apocalyptic prophet put it, “If you don’t have the vaccine ready and [the pandemic] happens, you’re responsible.” When responsibility—legal, political, and moral—is adjudicated according to this peculiar temporal structure, worst-case scenarios and precautionary reasoning allow public health experts and institutions to be prepared for the next pandemic and for the next judgment. But what about cases in which judgments of responsibility are not predicated on the prophet having been right? Recall the economists and bankers who failed to foresee the collapse of the financial system in 2008. Modest regulatory reforms responded to calls for accountability, but they were overshadowed by massive bailouts and more business as usual. When does prophetic inaccuracy have political consequences? Why do prophets sometimes retain their authority despite having failed to foresee the future?

Finally, how can we relate Caduff’s insights to prophetic proclamations outside the domain of pandemic preparedness? The domain I know best is the popular and scholarly discourse on cities, in which the future is an incessant refrain. My interest was piqued by Caduff’s closing reference to Mike Davis—perhaps the most prominent prophet of the urban future—and his racialized fear that megacity slums are breeding grounds for the next plague. Caduff’s critique of this apocalyptic scenario is shared by many urban scholars (Robinson 2010; Zeiderman 2008). But, importantly, Davis’s vision is at once biomedical and political. In other writings, these same slums hold out the promise of a global revolution (2006). Dystopia and utopia go together for Davis, as they do for millenarians the world over. Prophecy foretells death and destruction as well as salvation and redemption. Is there a utopian vision in the dystopian politics of pandemic preparedness?

---

## Reply

Are these scientists really prophets? The question provoked a set of insightful and generous comments, allowing me to return to the problem and refine the argument about the place of faith in reason today. In his response, Faubion reminds us that such faith has always been a trademark of European Enlightenment and the modern scientific enterprise. Faubion’s genealogical considerations are indeed illuminating. He argues that the apocalyptic tone recently adopted in science is characteristic of a preoccupation with the catastrophic that he terms “premillennialist.” The current articulation of this preoccupation, however, is not without social and political consequences; on the contrary, it is increasingly implicated

in the construction of powerful institutional arrangements for the biopolitical government of bodies and populations.

Scientists are not prophets, they are shamans, writes Keck. They induce altered states of consciousness and push the possibility of disaster into the open space of fiction, that is to say, into the universe of the unverifiable (Morris 2011). Keck's hope is that a close collaboration with the shamanistic science of pandemic disaster will "provide us with better images of animals and the environment." Such collaboration is crucial, to be sure, but it begs an important question: What makes some images "better" than others?

It is perhaps in Hinchliffe's response where we might find an answer to the question. Hinchliffe insists that the problem of pathology must not be reduced to a matter of infection. The task of critical inquiry is to shift the focus away from the naturalized threat of the mutant microbe to the conditions of possibility that allow viruses to go viral in the first place. What are the socialities, ecologies, and economies that account for the observation of a rising number of infectious diseases? Such symptomatology, in the tradition of Deleuze, is of course bad news for the shrinking margins of intensive animal farming and industrial food production, a system that is constantly on the verge of collapse and that seems to be responsible for the factory-farmed pathologies of our time. The concentration, simplification, and enclosure of the food system "may well be producing the conditions for its own emergency," warns Hinchliffe. If viruses go viral, it means that a tipping point has been reached.

Many scholars have argued that scientists increasingly appeal to conditions of uncertainty and unpredictability to affirm their authority. Hinchliffe highlights the strategic function of "uncertainty as justification." In their comments, MacPhail and de Abreu specify this function in important ways. Characteristic for pandemic prophecy are the certainty of uncertainty and the predictability of unpredictability, notes MacPhail. Today's faith in the "inevitability of something happening" articulates a logic of excess, explains de Abreu. The "mysterious forces" that Max Weber invoked in his famous account of science as a vocation have not vanished; they are back in town and have taken concrete shape in the figure of the virus, a virus that is always one step ahead. The mutant microbe has come into being as a material incarnation of the "unknowable." This means that the figure is enchanted and that technical means and rational calculation will never be able to master it.

If you cannot master the microbe, prepare for the consequences. That is the message of preparedness. Not surprisingly, the presumed necessity of pandemic preparedness has generated a salient source of state subsidies for the pharmaceutical industry. Endless speculation about the possibility of a public health emergency has produced a lucrative market for commercial products. The citizens of the wealthy nations are perceived as "patients-in-waiting," as subjects of "future possible illness" (Sunder Rajan 2006:144). Prepandemic purchase agreements for protective vaccines and the stockpiling

of antiviral treatments reinforce the preventive message of "drugs for life" (Dumit 2012).

Napier notes that the fallacy of foresight has lulled people into thinking that they can manage risk and control the future. The financial crisis proved these people wrong. As Zeiderman indicates, worst-case scenarios seem to have more traction in the world of pharmaceutical health than in the world of convertible capital. Webster, Whittington reminds us, continued to deliver his apocalyptic message "while buying stock in the prestige economy of salvation." Zeiderman nevertheless wonders whether there might be a "utopian vision in the dystopian politics of pandemic preparedness." But perhaps it is precisely the dialectic of dreamworld and catastrophe that must be interrupted?

I have to admit that I am less optimistic about the "reasoned relationships to possible futures" that Whittington associates with the scientific field. He thinks I should give more emphasis to the scientific practices of the researchers. But what if there is no correlation between the practices and the predictions? The gap is precisely the reason why I have termed pandemic pronouncements "prophetic." Whittington's faith in "reasoned relationships" is admirable, but can we share it? The voice of measured reason and the virtue of intellectual integrity may prevail in the field that he explores, but they are not the most prominent features of the public culture of pandemic influenza. What we can find at the core of this culture is an endless production of "apocalyptic pulp." The presence of such pulp is undeniable; it evokes a scene of rapture and summons a shamanistic science of dreadful scenarios. This science is caught up in majestic clouds of uncertainty, and the conflation of the "prophetic with the profitable" is likely to continue (Comaroff and Comaroff 1999:281). The "hedged future" of the infinite threat is your investment opportunity. Can we imagine another politics of life?

—Carlo Caduff

## References Cited

- Agamben, G. 2005. *The time that remains: a commentary on the letter to the Romans*. Stanford, CA: Stanford University Press.
- Altman, L. K. 1989. Fearful of outbreaks, doctors pay new heed to emerging viruses. *New York Times*, May 9, C3.
- Ardner, E. 1989. *The voice of prophecy and other essays*. Oxford: Basil Blackwell.
- Aretxaga, B. 2002. Terror as thrill: first thoughts on the "war on terrorism." *Anthropological Quarterly* 75:138–150.
- Augustine, Saint. 1998. *The city of God against the pagans*. 1998. R. W. Dyson, ed. and trans. Cambridge: Cambridge University Press.
- Balfour, Ian. 2002. *The rhetoric of romantic prophecy*. Stanford, CA: Stanford University Press.
- Benjamin, Walter. 1991. "Über den Begriff der Geschichte." In *Abhandlungen: Gesammelte Schriften*, vol. 1 (2). H. Schweppenhäuser and R. Tiedemann, eds. Pp. 691–704. Frankfurt am Main: Suhrkamp.
- . 1996 (1916). On language as such as the language of man. In *Selected writings*, vol. 1, 1913–1916. Marcus Bullock and Michael W. Jennings, eds. Pp. 62–74. Cambridge, MA: Belknap. [MJAD]
- Berger, J. 1999. *After the end: representations of post-apocalypse*. Minneapolis: University of Minnesota Press.
- Bergson, H. 1998. *La pensée et le mouvant*. Paris: PUF. [FK]
- Berlant, Lauren. 2011. *Cruel optimism*. Durham, NC: Duke University Press.

- Bourdieu, P. 1977. *Outline of a theory of practice*. Cambridge: Cambridge University Press.
- . 1984. *Distinction: a social critique of the judgement of taste*. London: Routledge.
- Boyer, P. 1992. *When time shall be no more: prophecy belief in modern American culture*. Cambridge, MA: Harvard University Press.
- Brown, N. 2003. Hope against hype: accountability in biopasts, presents and futures. *Science Studies* 16:3–21.
- Caduff, C. 2012. The semiotics of security: infectious disease research and the biopolitics of informational bodies in the United States. *Cultural Anthropology* 27:333–357.
- Callon, Michel, Pierre Lascoumes, and Yannick Barthe. 2009. *Acting in an uncertain world: an essay on technical democracy*. Cambridge, MA: MIT Press. [TM]
- Canon, G. 1994. Foreword. In *Mad cow disease: the history of BSE in Britain*. R. W. Lacey, ed. Pp. vii–xi. Jersey: Cypsel. [SH]
- Carlson, Thomas A. 2008. *Indiscrete image: infinitude and the creation of the human*. Chicago: University of Chicago Press. [MJAD]
- Colizza, V., and A. Vespignani. 2010. The flu fighters. *Physics World* 23(2): 26–30. [SH]
- Collier, S. J. A. 2008. Enacting catastrophe: preparedness, insurance, budgetary rationalization. *Economy and Society* 37:224–250. [MJAD]
- Comaroff, J. 2007. Beyond bare life: AIDS, (bio)politics, and the neoliberal order. *Public Culture* 19:197–219.
- Comaroff, J., and J. L. Comaroff. 1999. Occult economies and the violence of abstraction: notes from the South African postcolony. *American Ethnologist* 26:279–303.
- Cooper, Melinda. 2006. Pre-empting emergence: the biological turn in the War on Terror. *Theory, Culture and Society* 23:113–135.
- . 2008. *Life as surplus: biotechnology and capitalism in the neoliberal era*. Seattle: University of Washington Press.
- Culliton, B. J. 1990. Emerging viruses, emerging threat. *Science* 247:279–280.
- Davis, M. 2004. A deadly plague of slums. In *Common dreams*, February 3. <http://www.commondreams.org/views/04/02/03-05.htm>.
- . 2005. *The monster at our door: the global threat of avian flu*. New York: New Press.
- . 2006. *Planet of slums*. New York: Verso. [AZ]
- De Abreu, Maria José A. 2013. Technological indeterminacy: threat, medium, temporality. *Anthropological Theory* 13:267–284. [MJAD]
- Derrida, Jacques. 1998. Faith and knowledge: the two sources of “religion” at the limits of religion alone. In *Religion*. Samuel Weber, trans. Jacques Derrida and Gianni Vattimo, eds. Pp. 1–78. Stanford, CA: Stanford University Press. [MJAD]
- Dilley, R. 2010. Reflections on knowledge practices and the problem of ignorance. *Journal of the Royal Anthropological Institute* 16:167–192.
- Dumit, J. 2012. *Drugs for life: how pharmaceutical companies define our health*. Durham, NC: Duke University Press.
- Evans-Pritchard, E. E. 1937. *Witchcraft, oracles and magic among the Azande*. Oxford: Oxford University Press.
- . 1956. *Nuer religion*. Oxford: Clarendon.
- Ewald, François. 2002. The return of Descartes’ malicious demon: an outline of a philosophy of precaution. In *Embracing risk: the changing culture of insurance and responsibility*. T. Baker and J. Simon, eds. Pp. 273–301. Chicago: University of Chicago Press.
- Ewald, François, C. Gollier, and N. de Sadeleer. 2001. *Le principe de précaution*. Paris: Presses Universitaires de France.
- Farmer, Paul. 1992. *AIDS and accusation: Haiti and the geography of blame*. Berkeley: University of California Press.
- . 2004. *Pathologies of power*. Berkeley: University of California Press. [SH]
- Fassin, D., and M. Pandolfi, eds. 2010. *Contemporary states of emergency: the politics of military and humanitarian interventions*. Cambridge, MA: MIT Press.
- Faubion, J. D. 2001. *The shadows and lights of Waco: millennialism today*. Princeton, NJ: Princeton University Press.
- Fortun, M. A. 2008. *Promising genomics: Iceland and deCODE genetics in a world of speculation*. Berkeley: University of California Press.
- Foucault, Michel. 2011. *The courage of truth: the government of self and others II*. Basingstoke: Palgrave Macmillan.
- Galison, Peter. 2004. Removing knowledge. *Critical Inquiry* 31:229–243.
- Garrett, Laurie. 1994. *The coming plague: newly emerging diseases in a world out of balance*. New York: Penguin.
- Geissler, W. P. 2013. Public secrets in public health: knowing not to know while making scientific knowledge. *American Ethnologist* 40:13–34.
- Goffman, Irving. 1959. *The presentation of self in everyday life*. New York: Doubleday. [TM]
- Gramsci, A. 1971. *Selections from the prison notebooks*. London: Lawrence & Wishart. [SH]
- Greenhouse, C. J. 1996. *A moment’s notice: time politics across cultures*. Ithaca, NY: Cornell University Press.
- Guyer, J. I. 2007. Prophecy and the near future: thoughts on macroeconomic, evangelical, and punctuated time. *American Ethnologist* 34:409–421.
- Hamayon, Roberte. 2012. *Jouer: une étude anthropologique*. Paris: La Découverte. [FK]
- Haraway, Donna. 1997. Modest witness@second millennium. In *Modest witness@second millennium: femaleman meets oncomouse*. D. Haraway, ed. Pp. 23–39. New York: Routledge.
- Harding, S. F. 2000. *The book of Jerry Falwell: fundamentalist language and politics*. Princeton, NJ: Princeton University Press.
- Helmreich, S. 2009. *Alien ocean: anthropological voyages in microbial seas*. Berkeley: University of California Press.
- Hinchliffe, Stephen, J. Allen, Stephanie Lavau, Nick Bingham, and Simon Carter. 2013. Biosecurity and the topologies of infected life: from borderlines to borderlands. *Transactions of the Institute of British Geographers* 38(4):531–543. [SH]
- Kaufmann, Yoram. 2009. *The way of the image: the orientational approach to the psyche*. New York: Zahav Books. [DN]
- Keck, Frédéric. 2010a. *Un monde grippé*. Paris: Flammarion.
- . 2010b. Une sentinelle sanitaire aux frontières du vivant: les experts de la grippe aviaire à Hong Kong. *Terrain* 54:26–41. [FK]
- Keck Frédéric, and Andrew Lakoff, eds. 2013. Sentinels devices. *Limn*, no. 3. <http://www.socgen.ucla.edu/2013/06/2013-limn-issue-3-sentinels-devices>. [FK]
- Kilbourne, Edwin. D. 1993. Afterword: a personal summary presented as a guide for discussion. In *Emerging viruses*. Stephen S. Morse, ed. Pp. 290–295. Oxford: Oxford University Press.
- King, N. B. 2002. Security, disease, commerce: ideologies of postcolonial global health. *Social Studies of Science* 32:763–789.
- . 2004. The scale politics of emerging diseases. *Osiris* 19:62–76.
- Kleinman, A., and J. L. Watson, eds. 2006. *SARS in China: prelude to pandemic?* Stanford, CA: Stanford University Press.
- Kolata, G. 2007. Study shows why the flu likes winter. *New York Times*, December 5.
- Koselleck, Reinhart. 2004. *Futures past: on the semantics of historical time*. New York: Columbia University Press. [AZ]
- Krause, R. M. 1992. The origin of plagues: old and new. *Science* 257:1073–1078.
- , ed. 1998. *Emerging infections*. San Diego: Academic Press.
- Lakoff, Andrew. 2007. Preparing for the next emergency. *Public Culture* 19(2): 247–271. [MJAD]
- . 2008. The generic biothreat, or, how we became unprepared. *Cultural Anthropology* 23:399–428.
- Latour, B. 2000. Du principe de précaution au principe du bon gouvernement: vers de nouvelles règles de la méthode expérimentale. *Les études*, no. 3934: 339–346.
- Laurance, J. 2010. The swine flu backlash. *Lancet* 375:367.
- Leach, M., and I. Scoones. 2013. The social and political lives of zoonotic disease models: narratives, science and policy. *Social Science and Medicine* 88:10–17. [SH]
- Lederberg, J., R. E. Shope, and S. C. Oaks, eds. 1992. *Emerging infections: microbial threats to health in the United States*. Washington, DC: National Academy Press.
- Lee, N., and J. Motzkau. 2013. Varieties of biosocial imagination: reframing responses to climate change and antibiotic resistance. *Science, Technology and Human Values* 38(4):447–469. [SH]
- Leibler, J. H., J. Otte, D. Roland-Holst, D. U. Pfeiffer, R. Soares Magalhães, J. Rushton, J. P. Graham, and E. K. Silbergeld. 2009. Industrial food, animal production and global health risks: exploring the ecosystems and economics of avian influenza. *EcoHealth* 6:58–70. [SH]
- Lévi-Strauss, Claude. 1966. *The savage mind*. London: Weidenfeldt & Nicholson. [FK]
- Lowe, C. 2010. Viral clouds: becoming H5N1 in Indonesia. *Cultural Anthropology* 25:625–649.
- Lowen, A. C., S. Mubareka, J. Steel, and P. Palese. 2007. Influenza virus

- transmission is dependent on relative humidity and temperature. *PLoS Pathogens* 3 (10).
- . 2008. High temperature (30 degrees C) blocks aerosol but not contact transmission of influenza virus. *Journal of Virology* 82:5650–5652.
- Lowen, A. C., S. Mubareka, T. M. Tumpey, Garcia-Sastre-Adolfo, and P. Palese. 2006. The guinea pig as a transmission model for human influenza viruses. *Proceedings of the National Academy of Sciences* 103:9988–9992.
- Löwith, Karl. 1949. *Meaning in history: the theological presumptions of the philosophy of history*. Chicago: University of Chicago Press. [JDF]
- Luhmann, Niklas. 1998. *Observations on modernity*. Stanford, CA: Stanford University Press.
- Lutz, Catherine. 2001. *Homefront: a military city and the American 20th century*. Boston: Beacon. [MJAD]
- MacPhail, Theresa. 2010. A predictable unpredictability: the 2009 H1N1 pandemic and the concept of “strategic uncertainty” within global public health. *Behemoth* 3:57–77. [TM]
- . 2014. *Cover your mouth: a pathography of influenza in global public health*. Ithaca, NY: Cornell University Press. [TM]
- Masco, J. 2006. *The nuclear borderlands: the Manhattan Project in post-cold war New Mexico*. Princeton, NJ: Princeton University Press.
- . 2008. Survival is your business: engineering ruins and affect in nuclear America. *Cultural Anthropology* 23:361–398.
- . 2010. Atomic health, or how the bomb altered American notions of death. In *Against health: how health became the new morality*. J. M. Metzl and A. Kirkland, eds. Pp. 133–153. New York: New York University Press.
- McGoey, Linsey. 2012a. The logic of strategic ignorance. *British Journal of Sociology* 63:553–576.
- . 2012b. Strategic unknowns: towards a sociology of ignorance. *Economy and Society* 41:1–16.
- Miyazaki, Hirokazu. 2003. The temporalities of the market. *American Anthropologist* 105:255–265.
- . 2007. Arbitrating faith and reason. *American Ethnologist* 34:430–432.
- Morris, R. C. 2011. In the name of trauma: notes on testimony, truth telling and the secret of literature in South Africa. *Comparative Literature Studies* 48:388–416.
- Morse, S. S., ed. 1993. *Emerging viruses*. Oxford: Oxford University Press.
- . 1995. Factors in the emergence of infectious diseases. *Emerging Infectious Diseases* 1:7–15.
- Naas, Michael. 2009. Miracle and machine: the two sources of religion and science in Derrida’s “Faith and Knowledge.” *Research in Phenomenology* 39(2):184–203. [MJAD]
- Napier, A. David. 2003. *The age of immunology: conceiving a future in an alienating world*. Chicago: University of Chicago Press. [DN]
- . 2013a. Disaster play. *Social Anthropology* 21(1):57–61. [DN]
- . 2013b. A new sociobiology: immunity, alterity, and the social repertoire. *Cambridge Anthropology* 31(2):20–43. [DN]
- Neher, André. 1969. *The prophetic existence*. London: Thomas Yoseloff Ltd.
- O’Leary, S. D. 1994. *Arguing the Apocalypse: a theory of millennial rhetoric*. Oxford: Oxford University Press.
- Osterholm, M. T. 2005. Preparing for the next pandemic. *Foreign Affairs* 84: 24–37.
- Palese, Peter, and Jerome L. Schulman. 1976. RNA pattern of “swine” influenza virus isolated from man is similar to those of other swine influenza viruses. *Nature* 263:528–530.
- Povinelli, E. A. 2011. *Economies of abandonment: social belonging and endurance in late liberalism*. Durham, NC: Duke University Press.
- . 2012. Beyond the names of the people: disinterring the body politic. *Cultural Studies* 26:1–21.
- Preston, R. 1994. *The hot zone*. New York: Random House.
- Proctor, R. N., and L. Schiebinger. 2008. *Agnology: the making and unmaking of ignorance*. Stanford, CA: Stanford University Press.
- Riles, A., ed. 2006. *Documents: artifacts of modern knowledge*. Ann Arbor: University of Michigan Press.
- Robinson, Jennifer. 2010. Living in dystopia: past, present and future. In *Noir urbanisms: dystopic images of the modern city*. Gyan Prakash, ed. Pp. 218–240. Princeton, NJ: Princeton University Press. [AZ]
- Samimian-Darash, Limor. 2013. Governing future potential biothreats: toward an anthropology of uncertainty. *Current Anthropology* 54(1):1–22. [MJAD]
- Satcher, D. 1995. Emerging infections: getting ahead of the curve. *Emerging Infectious Diseases* 1:1–6.
- Schnirring, L. 2012. Debate on H5N1 death rate and missed cases continues. In *CIDRAP* (Center for Infectious Disease Research and Policy), <http://www.cidrap.umn.edu/news-perspective/2012/02/debate-h5n1-death-rate-and-missed-cases-continues>.
- Serres, Michel. 1995. *The natural contract*. Elizabeth MacArthur and William Paulson, trans. Ann Arbor: University of Michigan Press. [MJAD]
- Spencer, P. 2003. *Time, space, and the unknown: Massai configurations of power and providence*. London: Routledge.
- Stengers, I. 2010. *Cosmopolitics 1*. Minneapolis: University of Minnesota Press. [SH]
- Stewart, K., and S. F. Harding. 1999. Bad endings: American apocalypse. *Annual Review of Anthropology* 28:285–310.
- Stirling, Andy C., and Ian Scoones. 2009. From risk assessment to knowledge mapping: science, precaution, and participation in disease ecology. *Ecology and Society* 14(2):14, <http://www.ecologyandsociety.org/vol14/iss2/art14/>.
- Sunder Rajan, K. 2006. *Biocapital: the constitution of postgenomic life*. Durham, NC: Duke University Press.
- Sundkler, B. G. M. 1948. *Bantu prophets in South Africa*. London: Lutterworth.
- Taleb, Nassim Nicholas. 2010. *The black swan: the impact of the highly improbable*. Rev. ed. London: Penguin. [DN]
- Taubes, J. 1991. *Abendländische Eschatologie*. München: Matthes & Seitz.
- Taussig, M. 1999. *Defacement: public secrecy and the labor of the negative*. Stanford, CA: Stanford University Press.
- Weber, Max. 1946. Science as vocation. In *From Max Weber: essays in sociology*. H. H. Gerth and C. Wright Mills, trans and eds. Pp. 129–156. New York: Oxford University Press. [MJAD]
- Weber, Timothy. 1979. *Living in the shadow of the second coming: American premillennialism, 1875–1925*. New York: Oxford University Press. [JDF]
- Weldes, J., M. Laffey, H. Gusterson, and R. Duval, eds. 1999. *Cultures of insecurity: states, communities, and the production of danger*. Minneapolis: University of Minnesota Press.
- Whittington, Jerome. 2013. Fingerprint, bellwether, model event: anticipating climate change futures. *Limn*, no. 3 (May), <http://www.limn.it/fingerprint-bellwether-model-event-anticipating-climate-change-futures>. [JW]
- Wynne, B. 2010. Strange weather, again: climate science as political art. *Theory, Culture and Society* 27(2–3):289–305. [SH]
- Zeiderman, Austin. 2008. Cities of the future? megacities and the space/time of urban modernity. *Critical Planning* 15:23–39. [AZ]